

FIELD PROJECT REPORTS

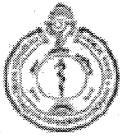
By

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CERTIFICATION

This is to certify that all the field projects submitted in this Bound Volume are original work done by Dr. Kisalay Datta during the first two field postings of six months each under the guidance of faculty of National Institute of Epidemiology (ICMR), Chennai and the local supervisor specially nominated for this purpose. This is in partial fulfillment of the requirements for the degree of Master of Applied Epidemiology.

Dated: 28/1/17


Director

National Institute of Epidemiology

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Dated:

KISALAYDATTA

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SECTION-1
FIRST FIELD POSTING

1.1 Situation analysis of district Hooghly, West Bengal, India, 2007

Introduction:

The public sector health system of India is one of the largest systems in the world in terms of its infrastructure. India has its own declared National Health and National Population Policy.¹ The birth rate has come down from 33.7/1000 population to 23.8/1000 population, crude death rate from 12.6/1000 to 7.6/1000 population and the infant mortality rate from 114/1000 live births to 58/1000 live births (SRS, 2005). The prevalence of tuberculosis, leprosy, filariasis, viral hepatitis, diarrhoea, dysentery and disorders of malnutrition has not shown any significant change. Diarrhoeal diseases and acute respiratory diseases are still the major killer diseases. Malaria and Kala-Azar which showed a decline in the 1960s have come back. Some non-communicable diseases like diabetes, heart disease, cancer, mental illness, hypertension, accidents and injuries etc show a growing threat.² MDR-TB is posing a potential threat to tuberculosis control in the country.

West Bengal has a population of 6, 80, 77,965 and a population density of 903 people/km² making it the most densely populated state in India (census of India, 2001).³ The birth rate is 18.8/1000 population, crude death rate 6.4/1000 population, the infant mortality rate 38/1000 live births (SRS, 2005)

and the maternal mortality ratio is 194/100000 live births (census of India). The diseases like Malaria, Dengue, Kala-Azar, Diarrhoeal Diseases, HIV, Tuberculosis, and Arsenicosis are the major public health problems the state is trying to combat.^{4, 5}

District Hooghly was having a population of 5.5 million with 18 blocks and 12 municipalities facing lot of public health problem like diarrhoeal diseases, tuberculosis and non-communicable diseases like Arsenicosis especially in two blocks and road traffic accidents. Moreover several industries, go downs, Warehouses, dumping places, markets, highways, garages, workshops become the reason of environmental pollution and accidents.⁶ Hence we had analyzed the situation of Hooghly in relation with its public health importance with the objective (1) to describe of geography, population and economical resources, (2) to know organization of the health system, (3) to understand major public health priorities and (4) to describe present health status related to indicators towards the millennium development goals.

Methods:

The key elements of the situation analysis in district Hooghly were geographic, socio-demographic and socio-economic characteristics; organization of the health system (such as structure, establishments, mode of operation, surveillance system, reporting system, laboratory back up); the major public health priorities (such as diarrhoeal diseases, acute respiratory tract infections, tuberculosis, malaria, sexually transmitted diseases including HIV infection, viral hepatitis, enteric fever, arsenicosis, industrial and road traffic accidents) and important health related millennium development goal

indicators (such as prevalence and death rate associated with tuberculosis, infant mortality rate, maternal mortality ratio per 100,000 live birth, measles immunization among children under one).

Data collection:

Primary investigator first visited different district level offices of health departments and other related departments. We visited the sub-divisional and block-level health and health related offices including all Block Primary Health Centers (BPHCs), rural hospitals (RHs), State General hospitals (SGHs), Sub-Divisional hospitals (SDHs) and District Hospital (DH) to explain the objectives of the study and the importance of verification of records and collection of reports. We also discussed with the in-charges and other staff to understand the organizational set-up of health system. We met Director of Health Services (DHS) and appraised him about my assignments. We also met Joint Director of Health Services (Public Health and Communicable Disease) and other officers to discuss and interview them for getting data pertaining to the government orders and existing surveillance system at health directorate which is at the Swastha Bhawan, Salt Lake, Kolkata – 700 091.

Principal investigator also consulted with various reports published at state and district level by department of health and family welfare, State bureau of health intelligence (SBHI), Hooghly Zilla Parishad (HZP) and district gazetteer. The reports included (1) District statistical hand book, 2005 (2) Census data, 2001 (3) SRS report, 2004 (4) West Bengal human development report, 2004 (5) National Family Health Survey 2 & 3 report (6)

Health on march 2005-06, West Bengal (7) Millennium development goals, India country profile, World bank and (8) The World Health report, 2004.

Results:

Location, climate, geography, population and economical resources:

The name of the district probably came from HOGLA, a special kind of grass. The district is rich in historical importance. Chandanangar, one subdivision of the district, was the head quarter of the Portuguese in the eighteens. The head quarter Chinsurah is also historically, economically important in the state. The district was composed of 210 gram panchayat and 11 municipalities and 1(one) corporation.⁶ There were several industries along the bank of river Ganges. So the district was cosmopolitan in nature. There were 496 brick fields and 236 rice meals in the district where migratory workers mainly work.⁶ All these factors affected the total health scenario of the district. According to the census 2001 the total population of the district is 50, 41, 900 (projected population is around 55 lacks).⁶ The latitude and longitude of Hooghly district are $23^{\circ} 1' 20''$ - $22^{\circ} 39' 32''$ (N) and $88^{\circ} 30' 15''$ – $87^{\circ} 30' 20''$ (E).⁶ The total geographical area of the district is 3149 sq. km and density of population per sq km is 1601.⁶ The district was bounded on eastern side by river Ganges. Districts North 24 Parganas and Nadia lie on the eastern side and Bankura and Midnapur on the western side, Badhaman on the northern side and Howrah on the southern side (figure-1&2).⁶ Rainfall of the district was 1118 mm in 2006 where as normal to be expected is 1477.⁶ The maximum and minimum temperature of the district in 2006 was 40 degree & 8 degree

respectively.⁶ As per 2001 census the total Population of the district was 50, 41,900. About 24, 52,400 (48.64%) of the populations were females. The proportion of Schedule caste and Schedule tribes were 23.58% and 4.2% respectively. The projected population 2007 is 54, 69,478 (Table-2).

Hooghly has got three main seasons. Hot & dry from March to first week of June, hot & wet from second week of June to second week of October and cool from third week of October to February. South western monsoon determines weather & rainfall. Natural resource-soil is ideal for agriculture. Main crops are paddy, potato, jute, sugarcane, oilseeds, wheat, pulses, different type of vegetables & fruits.⁶

Major public health priorities:

The public health problems of Hooghly district were related with infantile and maternal conditions; communicable and non-communicable diseases; aftermath of flood and water logging; environmental pollution; migrant laborers, industrial and road traffic accidents. Important communicable diseases were acute diarrhoeal diseases, acute respiratory tract infections including pneumonia, viral hepatitis, enteric fever, tuberculosis and sexually transmitted diseases including HIV/AIDS. Table-1 indicates a brief description of main public health priorities with corresponding prevention and control programme.

Organization of the health system

The Chief medical officer of health (CMOH) is the overall in-charge of health care delivery system of the district. The Director of health services (DHS) and

District Health and Family Welfare Samity (DHFWS), Hooghly guide him. DHFWS is a society with Savadhipati, Hooghly Zilla Parishad, as the chairman, District Magistrate as the vice-chairman, CMOH as the member secretary and other members are from the related departments. (Figure-3) indicates the flow chart showing the health administrative set-up.

Indicators towards the Millennium Development Goal (MDG):

Present health status related to indicators towards the millennium development goal in district Hooghly, West Bengal, India were mostly on better side than that of state and national level. However incidence and prevalence of tuberculosis indicated lower figure. Selected indicators with their values and comparison data from state and national level are listed in Table-8. Most of the data for Goal 1 were not available. However in Goal 1 percentage of children 6-59 month of age who received one dose of vitamin A in the past six months and proportion of infants under six months who were exclusively breastfed were on higher side than state and national level (table-3).

Most of the criteria of Goal 4 including Infant mortality rate (26), Measles immunization among children under one (91%) and Maternal mortality ratio (201) were better than state and national level. In Goal 5, performance in relation with the proportion of births attended by skilled health personnel (47.28%) was lower than the state average, contraceptive prevalence rate (69.72%) was better than the state and national average, percentage of women receiving antenatal care (85%) was also better than the state and national average. For Goal 6, most of the data are available. Here condom

use rate was lower and percentage of STI patients were quite below the state and national level. For Goal 7, access of improved water source is better, but access to improved sanitation was poor in comparison to state and national level. No data was available for Goal 8.

Status of laboratory facilities:

In district Hooghly, several laboratories were functioning from primary health centre level to district Hospital (DH). Besides, there were hospitals run by the central government agencies (Singur RHUTC), ESI hospital, and local bodies. There were also several private laboratories.

Performance of District Public Health Laboratory:

The district level public health laboratory is established at District hospital, but was not set up properly. Some material input was given. Arrangements of bacteriological testing of water, detection facilities of Kala-Azar and malaria, preparation of transport media for stool culture had been made, but due to technical reasons they were not materialized.

Performance of laboratories at district hospital (DH) level:

Most routine hematological, urine and stool, semen and aspirated fluid tests were carried out at District hospital level. This laboratory was the only one having best infrastructure among all government health facilities in the district. If its full resources and infrastructures were utilized, it could act as a reference laboratory.

Performance at Sub-Divisional / State General Hospital Level:

A good number of routine hematological, urine and stool investigations were carried out at this level. These laboratories could be utilized for appropriate tests necessary for the surveillance of the diseases and during outbreak situation.

Performance at Rural Hospital, Block Primary Health Centre & Primary Health Centre Level:

The laboratory services at this level were actually limited to examination of malaria slides and sputum microscopy for AFB under RNTCP in most of the institutions.

Involvement of laboratories in outbreak situation:

In BPHCs and Rural Hospitals, laboratories were routinely utilized for only malaria and tuberculosis passive surveillance work. None of those laboratories were involved in the laboratory investigations of public health emergencies. The district hospital had a facility for water testing, which was rarely utilized. Proper orientation and networking of these establishments and utilization of their full potential was required.

Involvement of laboratories in private sector:

Besides seven other hospitals, there were 239 nursing homes and 128 pathological laboratories, which were government recognized. Most of them were concentrated in district head-quarter.

Role of State level laboratories:

School of Tropical Medicine, Kolkata acted as the reference laboratory at the state level. Stools, water samples, blood samples were supposed to be examined at this institute to provide feedback to the concerned.

Role of National level laboratories:

Presently, National Institute of Cholera and Enteric Diseases (NICED, ICMR), Kolkata, helps the state government during epidemic investigation, when asked for. National Institute of Virology (NIV, ICMR), Pune, also did some investigations. National level laboratories routinely helped in polio surveillance. National Institute of Epidemiology (NIE, ICMR), Chennai, was also contributing by expertising our programme officers. All India Institute of Hygiene and Public Health (AIIPH), Kolkata, also helped the state government in this respect.

The laboratories at district, sub-divisional and state general hospitals were not doing many of the investigations, which they were supposed to do. Most of the centres had inadequate number of technicians. Supply of consumables and reagents was not steady. However, the government had a chain of laboratories, which could be explored for better public health activities and clinical management (Fig 4).

Discussion:

Low-lying areas encircled by large rivers and tropical climate make the district flood prone. This results in prevalence of water and vector borne diseases in the district particularly in post monsoon. Besides heavy population density and continuous in- and out- migration turn the district vulnerable for communicable diseases. Diarrhoeal diseases were major health problems in the entire district. Frequent occurrence of outbreaks and deaths due to dehydration took place, which was sometimes not reported. Tuberculosis was the second public health priority in the district. Incidence & prevalence associated with tuberculosis were lower than state and national level. Tuberculosis,

particularly resistant cases and incomplete treatment were major problems. Deaths due to acute respiratory tract infections, particularly among children, were still major public health problems. Enteric fever and viral hepatitis were other problems. Industrial pollution and both industrial and road traffic accidents were other health problems in the district. As a whole the surveillance system in the district in relation with the IDSP was not up to the mark but the AFP and measles surveillance system run by WHO, NPSP was satisfactory. Organizational set-up was in existence from district to sub-centre level. There were vacancies of manpower in some key posts particularly in the periphery. Moreover community block to sub-centre level, health personnel had to serve more population beyond the existing norm causing increased workload, consequently decrease their quality of work. From sub-centre to district level some data were regularly generated, but some data pertaining to the indicators of millennium development goals were not generated. Indicators of millennium development goals were satisfactory but not up to the mark, demanded special attention and specific micro plan. Most of the health personnel were not aware of the millennium development goal. In the district level some data were regularly generated but some data pertaining to the indicators of millennium development goals were not generated and for this, some modifications were required in the forms (data collection instruments). In addition to this, analysis of the raw data were to be done at the level of block and district so that the officer concerned could take appropriate measures at their own level as per the result of analysis.

Hence, we proposed potential areas of work for my various assignments which included (1) Acute Flaccid Paralysis surveillance system for

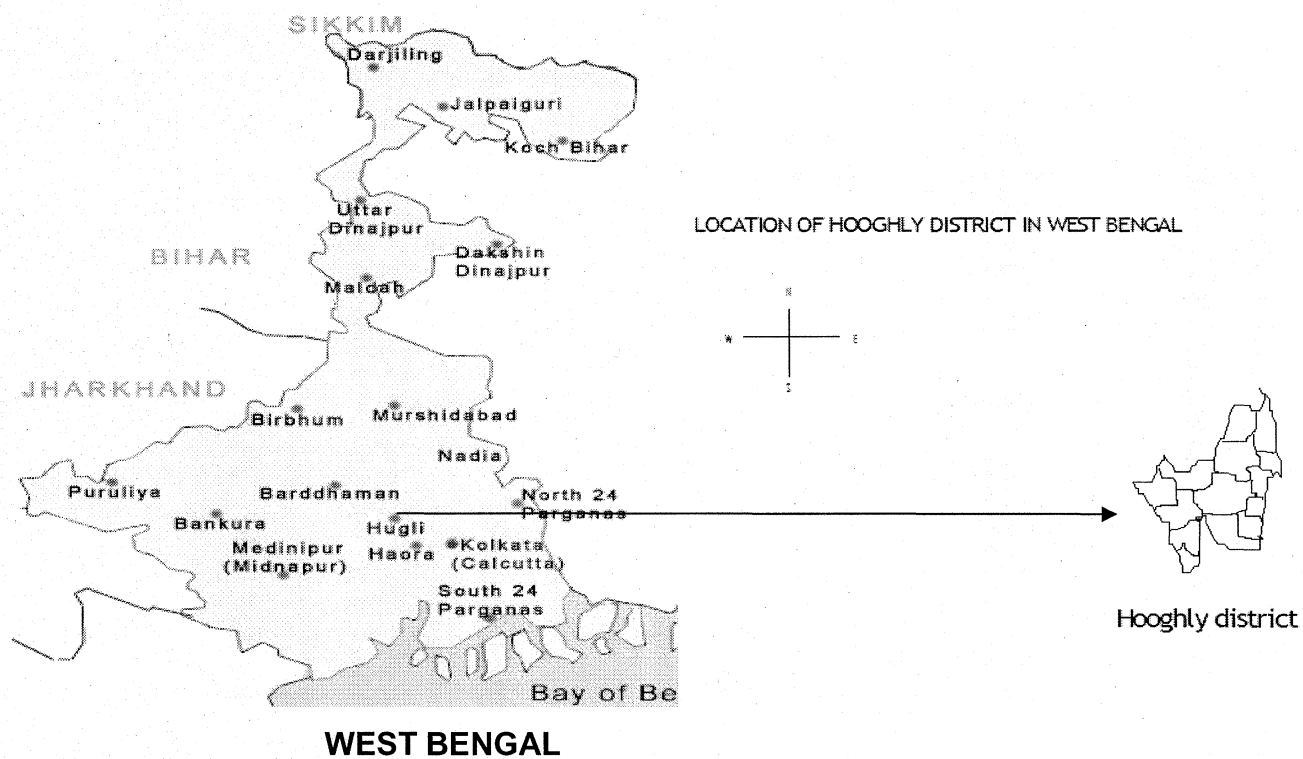
Poliomyelitis (description and evaluation) and (2) Revised National TB Control Programme (secondary data analysis and programme evaluation).

Based on the above findings, we recommended that the existing infrastructure needs to be strengthened including provision of properly trained manpower. There should be regular supervision from district health authority. Health establishments need sensitization on disease surveillance, the role of laboratories in surveillance and in outbreak control. Laboratories of other government and private hospitals and private laboratories could play an important role in disease surveillance as many diseases were diagnosed first by them. Public health priorities like TB, ARI, diarrhea and HIV should get more importance to the health authority.

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2. Millennium Development Goals (India Country Profile), World Bank
3. West Bengal Human Development Report, 2007
4. Health on the March, 2005-2006
5. SRS, Department of Health & Family Welfare, Govt. of West Bengal
6. District Statistical Handbook 2005
7. The World Health Report 2006, annexure- 7.
8. Records of office of the Dy-CMOH II, Hooghly
9. Records of office of the Dy-CMOH III, Hooghly
10. Records of office of the ACMOH (FW & PH), Hooghly

Fig 1: MAP SHOWING LOCATION OF HOOGLY DISTRICT IN WEST BENGAL INDIA 2007



Abbreviations:

Dy. CMOH – Deputy Chief Medical Officer of Health

DIO – District Immunization Officer

ZLO – Zonal Leprosy Officer

DTO – District Tuberculosis Officer

ACMOH - Assistant Chief Medical Officer of Health

SD – Sub division

BMOH- Block Medical Officer of Health

MO- Medical Officer

RKS- Rogi Kalyan Samity

BSI – Block Sanitary Inspector

BPHN – Block Public Health Nurse

SWO – Social Welfare Officer

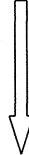
MI – Malaria Inspector

MA – Medical & Administration

ASHA- Accredited Social Health Activists

Fig-4: Flow Chart of Laboratories of Government facilities:

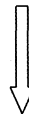
Block Primary Health Centre / Rural Hospitals



State General Hospitals / Sub-Divisional Hospital



District Hospital



School of Tropical Medicine (STM) [State level laboratory]



NICED (ICMR), Kolkata; NIV (ICMR), Pune [Central level laboratory]

Table 1: Key public health priorities in district Hooghly, West Bengal, 2007

Public health priority	Key elements	Ongoing prevention and control Programmes
Diarrhoeal diseases	Frequent outbreak	Reproductive and child health programme Integrated disease surveillance programme
Tuberculosis	Increased morbidity and mortality Poor case detection	Revised National Tuberculosis Control Programme Private-Public Mix by joint collaboration with WHO and GLTRA
ARI	High rise of incidence of ARI	Routine Immunization, Nutrition, School Health Programme
Malaria	Annual parasite index	National malaria control programme

Table 2: Characteristics of population of district Hooghly, West Bengal, India, 2001

Population Age group	Population size (2001) (Number in thousands)	Proportion of the total (%)
Population 0-4 years of age	404.4	8.02
Population 5-14 years of age	1063	21.083
Population 15-29 years of age	1385.8	27.485
Population 30-44 years of age	1139.6	22.582
Population 44-59 years of age	639.5	12.683
Population 60 + years of age	409.6	8.123
Male population	2589.5	51.359
Female population	2452.4	48.64
Population above poverty level	3294.702	65.346
Population below poverty level	1747.198	34.651
General caste	3541.286	70.24
Schedule caste	1188.881	23.58
Schedule tribe	212.062	4.2
Other backward caste	99.671	1.97
Total population size	5041.9	100

Table 3: Indicators of progress for the health related millennium development goal, Hooghly, India, 2007.

Goal	Indicator	Value of the indicator		
		In [Hooghly]	In West Bengal	In India
Goal 1	Prevalence of underweight children < 5 years of age	NA	43.5(2005-06)	47(1999)
	Proportion of population below minimum level of dietary energy consumption	NA	NA	21(2001)
	Percentage of children 6-59 month of age who received one dose of vitamin A in the past six months	92.5 (2006-07)	79.54(2005-06)	NA
	Proportion of infants under six months who are exclusively breastfed	64.2(2006-07)	58.6(2005-06)	55.2(1999)
Goal 4	Under-five mortality rate	39 (2006-07)	48.7(2006-07)	67.6(2006-07)
	Infant mortality rate	26	38(2005)	58(2005)
	Measles immunization among children under one	78364(91%)-(2006-07)	87.95% (2005-06)	67%(2003)
Goal 5	Maternal mortality ratio	201(2006-07)	266(2006-07)	400(2006-07)
	Proportion of births attended by skilled health personnel	47.28%(2006-07)	56.74%(2003-04)	42.5%(2001)
	Contraceptive prevalence rate	69.72	49.9(2005-06)	48.2(99-00)
	Percentage of women receiving antenatal care	85.28%(2005-06)	60.82% (05-06)	NA

Goal (HIV)	6	HIV prevalence among 15-24 years old pregnant women	0.54%(2006)	0.8%(2005)	0.9%(2003)
		Condom use rate of the contraceptive prevalence rate	23.5	34.5(2004)	32.2(2004)
		Number of children orphaned by HIV/AIDS	NA	NA	NA
		Percentage of people using a condom during most recent higher risk sexual encounter	NA	72.2 (2004)	59(2001)
		Percentage of STI clients who are diagnosed and treated according to guidelines	61%(2003)	86%(2003)	89%(2003)
		Percentage of HIV-positive women receiving anti-retroviral treatment during pregnancy to prevent mother to child transmission of HIV	NA	15.02%(2004)	NA
Goal (Malaria)	6	Malaria death rate (1000 Malaria positive slide)	0.001%(2005)	0.008%(2005)	0.003%(2000)
		Proportion of people with uncomplicated malaria getting correct treatment at the health facility and community levels, according to the national guidelines, within 24 hours of the onset of symptoms	NA	NA	NA
		Percentage of pregnant women who have taken chemoprophylaxis or drug treatment for malaria	NA	NA	NA

	The proportion of households having at least one insecticide treated bed nets	NA	NA	NA
Goal (TB)	6 Prevalence and death rate associated with tuberculosis	Prevalence =123.1/lack/yr & death rate = 4.4%(2006)	Prevalence =137/lack/yr & death rate=3.9%(2006)	Prevalence =131/lack/yr & death rate= 3.4%(2006)
	Proportion of tuberculosis cases detected and cured under DOTS	6629 (60.6%) & 88.3 %(2006)	113728(65.29%) & 86.4 %(2006)	1396228 (61.73%) & 83.4 %(2006)
	Percentage of estimated new smear-positive tuberculosis cases registered under the DOTS approach	68 %(2006)	85 %(2006)	71%(2006)
Goal 7	Proportion of population with sustainable access to an improved water source, urban and rural	65.25% (2005-06)	27.90%	86.00% (2002)
	Proportion of urban population with access to improved sanitation	69.4(2005-2006)	59.50%	58% (2002)
Goal 8	Proportion of population with access to affordable essential drugs on a sustainable basis	NA	NA	NA

1.2 Secondary data analysis on tuberculosis, District Hooghly, West Bengal, India, 2007

Introduction:

Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis* and less commonly, by other organism of tuberculosis complex. Tuberculosis is a worldwide public health problem. Globally, it ranks seventh in morbidity causing diseases.¹ It is estimated that 8.8 million new cases of TB occur every year globally, of which about 95% are from developing countries. Majority of the estimated 1.8 million deaths that occur globally every year, are from developing countries.^{2,3} TB is the single largest cause of death among young people and the adults.²

India accounts for one fifth of global incidence of TB and tops the list of 22 high burden countries. Every year 1.8 million people develop tuberculosis of which 800,000 are infectious in nature and 1000 die per day due it. In India, more than 40% of population is infected with TB bacilli. The Revised National TB Control Programme was implemented in India in 1995 with the objectives of (1) achieving and maintaining 85% cure rate of newly detected sputum positive cases and (2) achieving and maintaining detection of at least 70% of new smear positive cases. RNTCP emphasizes diagnosis of TB patients with sputum microscopy and treating the patients under direct supervision with good quality of medicine. RNTCP was implemented in all the districts of India by 2005. In 2007 the average Annual risk of Tuberculosis infection (ARTI) in

the country was 1.5%. According to the programme parameters, the expected case load is 203 per 100,000 population of which 75 are expected to be smear positive, 75 are smear negative, 38 are re-treatment cases (the total of treatment after default cases, relapsed cases and failure cases) and 15 are extra pulmonary cases.⁴

In West Bengal, the new sputum positive case detection rate in 2007 was 76% while the cure rate of new sputum positive cases was 86%.⁵ Hooghly district of West Bengal with a population of 5,389,000 in 2007, is having 11 Tuberculosis units (TU), 57 designated microscopy centers (DMC) and 771 DOT centers (treatment centers).⁸ In spite of the adequate infrastructure and the programme running for last 12 years, the district is still not able to attain the objective of achieving 70% case detection rate. During 4th quarter 2006, new sputum smear positive case notification rate was 47/100,000 while the total case notification rate was 111/100,000.⁹ Case Notification rate of Hooghly district is far behind of the National and West Bengal case detection rates.

With this background, we analyzed the secondary data of TB for the year 2002-2006 with the following objectives of (1) identifying the possible reasons of poor case detection rate of new as well as the total cases and (2) proposing the recommendations to improve the case detection.

Methods:

Data collection:

We included all the Tuberculosis units (n=11) of the district. We visited District Tuberculosis Centre (DTC) and all the 11 tuberculosis units of the district and collected the data from 2002 to 2006.

Operational definitions:

We used the definition given in RNTCP manual and guidelines

1. Case definitions⁵:

Case: A patient in whom tuberculosis has been confirmed bacteriologically or diagnosed by a clinician.

Sputum smear positive pulmonary TB: smear positive pulmonary cases are those having at least two initial sputum smear examinations positive for acid fast bacilli or one sputum positive smear with either radiological abnormalities consistent with active pulmonary tuberculosis or a culture positive for *Mycobacterium tuberculosis*.

Sputum smears negative pulmonary TB: smear negative pulmonary cases are those with three initial sputum smears negative, three repeat sputum smears negative but have either a positive culture or radiographic abnormalities consistent with active pulmonary tuberculosis.

Extra pulmonary tuberculosis: Disease affecting any other organ except the lungs based on culture, histology, radiography or strong clinical evidence is defined as extra pulmonary tuberculosis.

New case: patient who never had any treatment for tuberculosis or has taken treatment for less than a month.

2. Treatment outcome Definitions:

Cured: A patient who is sputum smear negative in the last month of treatment and on at least one previous occasion during treatment.

Data Analysis:

We analyzed the data from 2002 to 2006 and calculated annual total patients registered, case detection rate, total new smear positive cases registered. We calculated total and new sputum positive case detection, symptomatic referral and sputum positivity rate over time, geographical distribution of cases inside the district and in different tuberculosis units, using denominators provided by the District Tuberculosis Centre (DTC) and Tuberculosis Units (TUs)

Results:

Overall trend of annualized case detection (ACDR) and new sputum positive case detection rate (NSPCDR): During 2002-2006, the annual case detection rate in the district ranged between 111 (fourth quarter, 2006) to 159.8 per 100,000 (second quarter, 2002) while the new sputum positive case detection rate ranged between 46.4 (4th quarter, 2005) to 66/100,000 (2nd quarter, 2005). Of the 20 quarters during 2002-2006, the ACDR was below the recommended target of 142/100,000 during 16 quarters while the NSPCDR was below the recommended target of 53/100,000 during 13 quarters (Fig 3).

ACDR and NSPCDR according to different Tuberculosis units: Of the 11 TUs in the district, the average ACDR during 2002-2006 was above 142/100,000 in one TU (Ahmedpur) while it was below 120/100,000 in five TUs (Tarakeswar, Khanakul, Arambag, Chanditala and Chandanangar) (Fig 1). The average NSPCDR during the same period was above 53/100,000 in three TUs (Tarakeswar, Polba and Ahmedpur) while it was below 40/100,000 in four TUs (Arambag, Khanakul, Chanditala and Chandanangar) (Fig 2). Serampore and Chanditala TUs had average ACDR and NSPCDR below 120/100,000 and 40/100,000 respectively. Both these TUs were in urban areas of the district.

Referral of chest symptomatic and sputum positivity rate: As per RNTCP guidelines, 2-3% of the new adult outdoor patients is chest symptomatic and should be referred for sputum smear microscopy. About 10% -15% of these chests symptomatic are sputum smear positive. In Hooghly district, the symptomatic referral of five TUs (Serampore, Chanditala, Khanakul, Arambag and Ahmedpur) was less than <2% while the sputum positivity in three TUs (Arambag, Khanakul and Chanditala) were below 10% (Figure-4).

Number of suspects examined per 100,000 populations: According to RNTCP guidelines, at least 200 suspects should be examined from a population of 100,000. The average number of suspects examined during 2002-2006 was less than 200 in ten of the 11 TUs (Fig.5). Uttar Para and Serampore TUs had lowest number of TB suspects examined.

The ratio between sputum positive and sputum negative pulmonary cases: In Hooghly district, during 2002-2006, the ratio of new sputum smear positive and new sputum smear negative TB cases ranged between 0.8-1.2 in four TUs while it ranged between 0.3-0.5 in the remaining seven TUs. As per the RNTCP guidelines, this ratio should be 1 (range: 0.8-1.2) [Fig 6].

Discussion:

In Hooghly district, the annual case detection and new sputum positive case detection rates were below the state and national average. We identified possible reasons for low ACDR and NSPCDR based on the secondary analysis of the programme data. The chest symptomatic referral and the proportion of TB suspects examined were inadequate in majority of TUs of the district. The ratio between NSP and NSN cases was also low.

The ACDR was lower than 142/100,000 in ten TUs while the NSPCDR was lower than 53/100,000 in eight TUs. The average number of suspects examined was also low in 10 TUs. This could be low symptomatic referral of TB suspects from the outpatient department. It is therefore necessary to arrange for an up-dated RNTCP training for the medical officers in district. It is also necessary to investigate other reasons for low case detection rates like shortage of medical officers and their attendance in OPD.

Low case detection was mainly seen among TUs in urban areas. In urban areas, a considerable proportion of patients go to the private sector. In Hooghly district, only 29 of the 695 private practitioners were involved in

RNTCP. Lower involvement of PPs in RNTCP in the district could also affect the case detection rates adversely in urban areas. Efforts are needed to understand reasons for non-involvement of private practitioners in RNTCP and the possible intervention to increase their involvement.

The NSP to NSN ratio in the district was less than one and in seven TUs it was below 0.5. These points towards over-reliance on chest radiography for the diagnosis of TB. This finding also suggests that Medical officers are not following the diagnostic algorithm of Revised National TB Control Programme.

Based on these findings, we proposed the following recommendation to increase the case detection rate in the district. First, In order to increase the referral of chest symptomatic, all medical officers need to be trained in RNTCP. District authorities also need to supervise the performance of Medical officers in the OPD. Second, reasons for non-involvement of private medical practitioners in RNTCP schemes need to be explored.

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Table1.PERFORMANCE OF RNTCP IN HOOGHLY, WEST BENGAL FROM 1ST QTR 2002 TO 4TH QTR 2006

Quarters	NSP	NSP ACDR /Lakh	Total Case	Total ACDR/lakh	Cure %	Conversion %	Death %	Failure %	Defaulter %
1st qrt 2002	583	49.4	1641	139.1	81	83	3.1	1.6	10.6
2nd qrt 2002	710	60.12	1838	159.8	82	82	2.9	2	8.8
3rd qrt 2002	608	51.5	1648	139.7	80	80	2.6	1.1	12.5
4th qrt 2002	559	47.4	Year	131.7	77.6	79	3.2	1.4	13.8
1st qrt 2003	599	48	1569	126	82.5	88.4	3.9	2.3	11.7
2nd qrt 2003	747	59.8	1788	143	85	92.7	4	1.5	9.8
3rd qrt 2003	673	53.8	1731	138.5	87	92.7	4.7	1.9	8.7
4th qrt 2003	637	51	1561	125	85.6	91.7	5.9	1.9	7.4
1st qrt 2004	607	46.5	1545	118.4	90.4	89.5	5.2	1.7	5.7
2nd qrt 2004	780	59.8	1921	147.2	89	89.8	4.7	1.4	4.6
3 rd qrt '04	665	51	1766	135.3	89	90.8	4.7	1.5	5.1
4 th qrt '04	659	50.5	1662	127.4	87.6	90.2	6.3	2.4	4.4
1 st qrt '05	759	56.4	1873	139.3	87.8	92	5	2.1	4.7
2 nd qrt '05	887	66	1912	142.2	87.5	91	4.3	2.3	4.9
3 rd qrt '05	688	51.2	1677	124.7	89.3	90	5.1	1.6	4.5
4 th qrt '05	624	46.4	1534	114	89	92	4.9	1.9	4.5
1 st qrt '06	712	53	1718	128	89	91	4.4	2	5
2 nd qrt '06	707	52	1729	128	88	89	4	2	5.3
3 rd qrt '06	694	51.5	1690	125.4	88.1	88.4	4.2	2.1	5.6
4 th qrt '06	627	47	1492	111	88	90	5	2.5	5.6
Global		53/L		142/lakh	>85%	>90%	<5%	<4%	<5%
Target ARTI			Achieved						
-1.5			Not Achieved						

FIGURE 1: MAP OF HOOGHLY DISTRICT SHOWING TU WISE AVERAGE ANNUALIZED CASE DETECTION RATE (ACDR) PER 100,000 AND RURAL-URBAN VARIATION OF TB CASES FROM 2002-2006

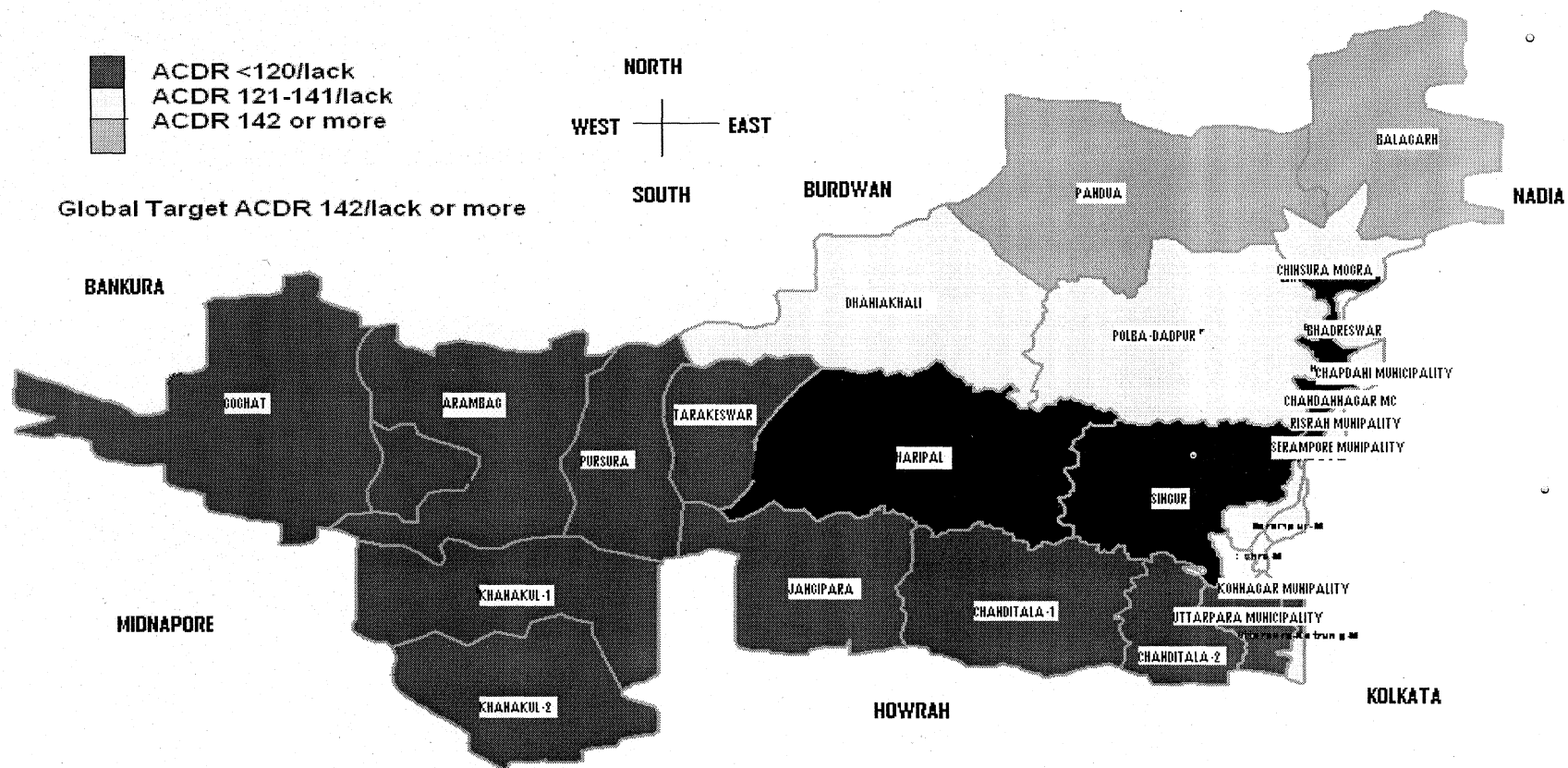


FIGURE 2: MAP OF HOOGHLY DISTRICT SHOWING TU WISE AVERAGE NEW SPUTUM POSITIVE CASE DETECTION RATE (NSPCDR) PER 100,000 FROM 2002-2006

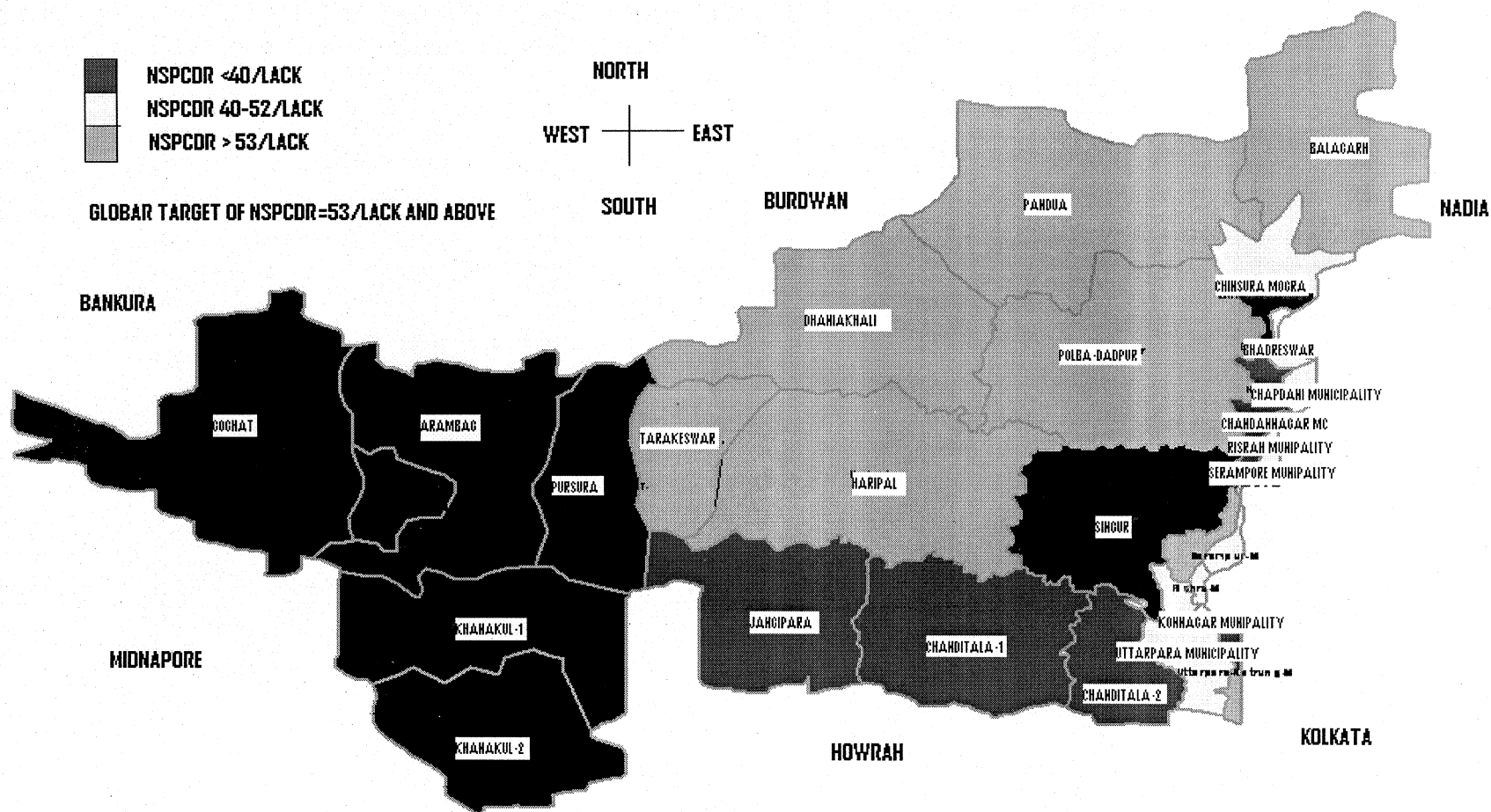


FIGURE- 3. TREND OF ANNUALIZED CASE DETECTION RATE (TARGET-142 PER 100,000) AND NEW SPUTUM POSITIVE CASE DETECTION RATE (TARGET-53 PER 100,000) IN HOOGHLY DISTRICT FROM 2002-2006

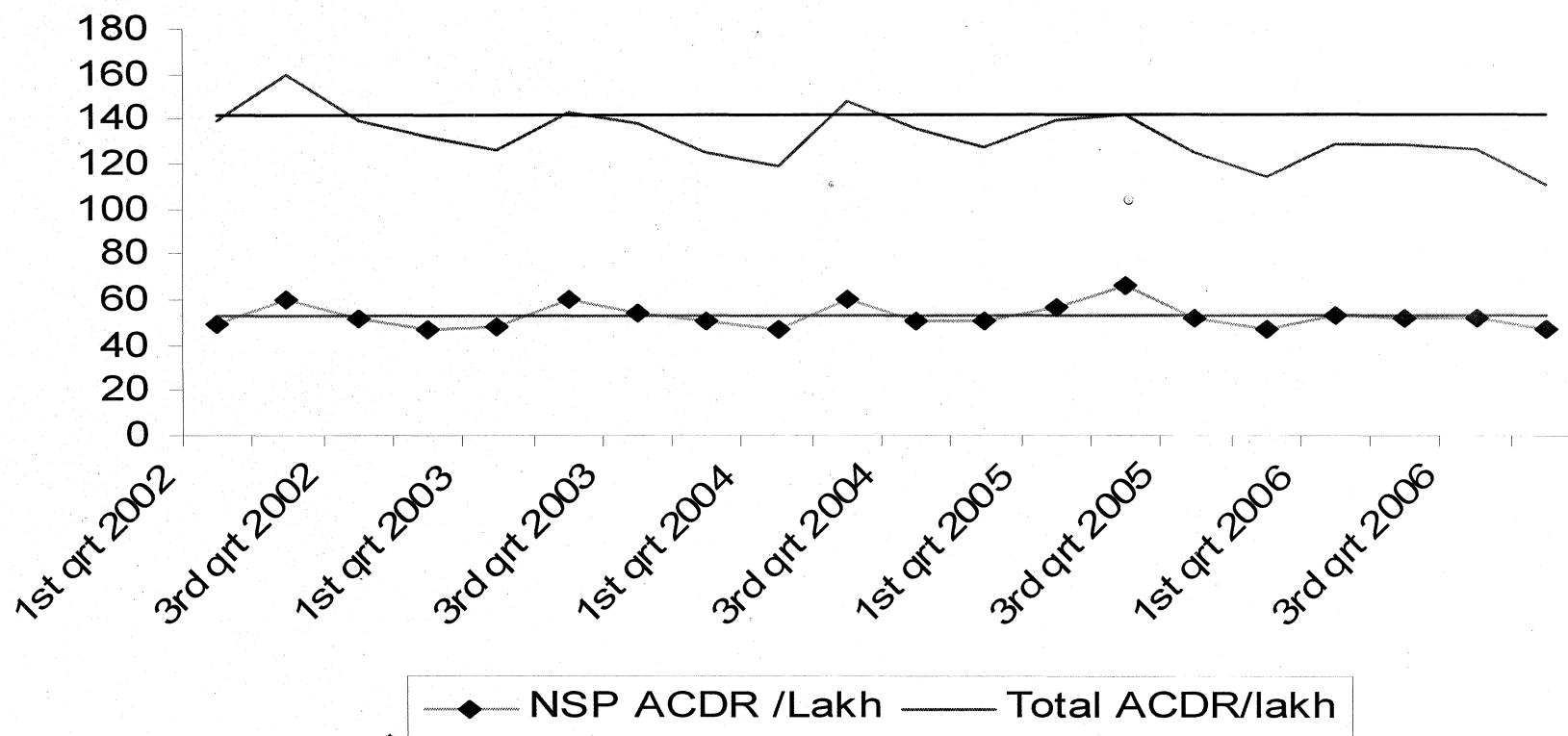


FIGURE -4: Proportion of average symptomatic referral (Target 2-3%) and sputum positivity rate (Target 10%) at different TUs in Hooghly district, West Bengal from 2002-2006

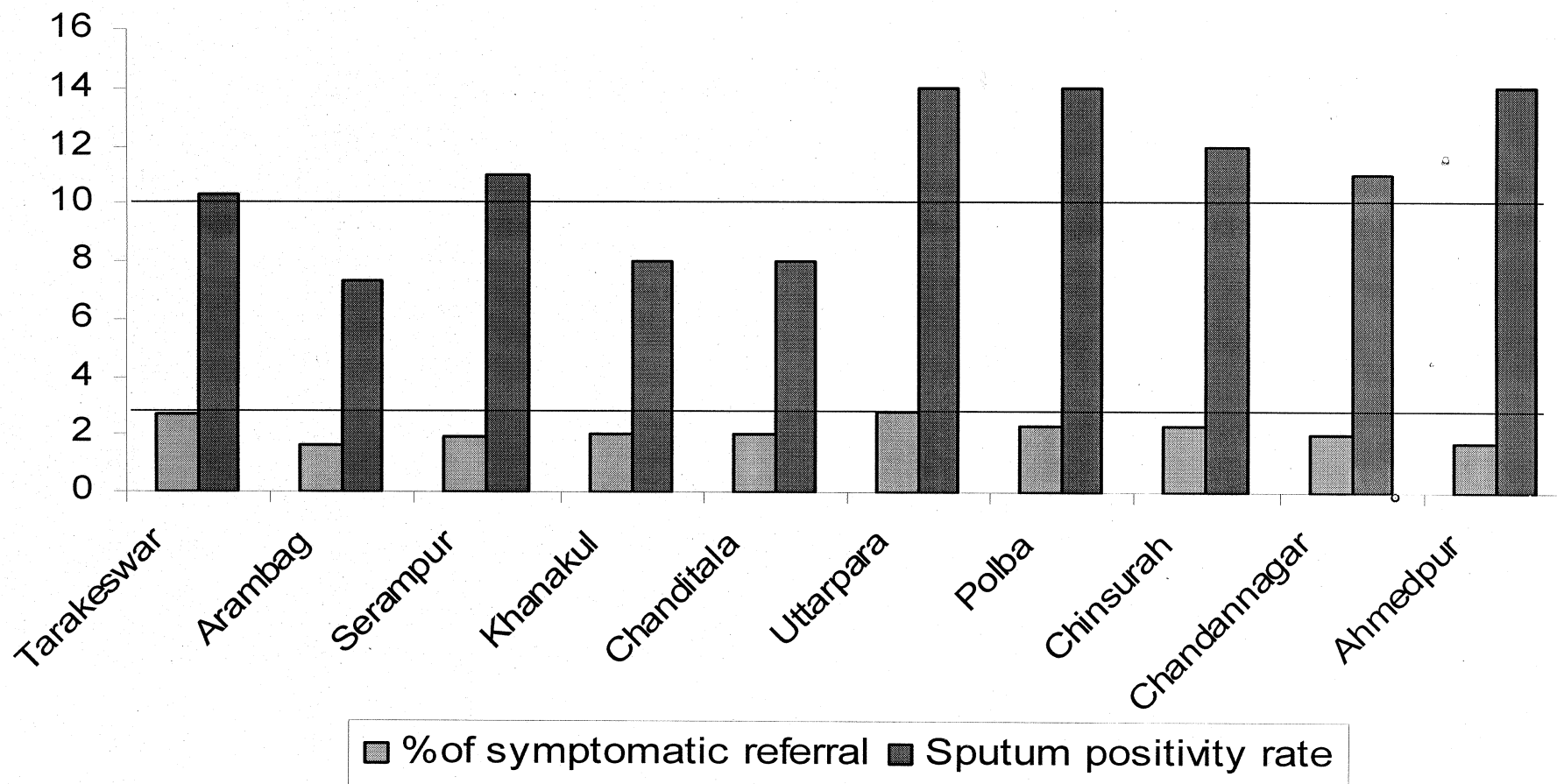


Figure-5: Proportion of average suspects examined per 100,000 (Target-200 suspects per 100,000) population at different TUs in Hooghly district from 2002-2006

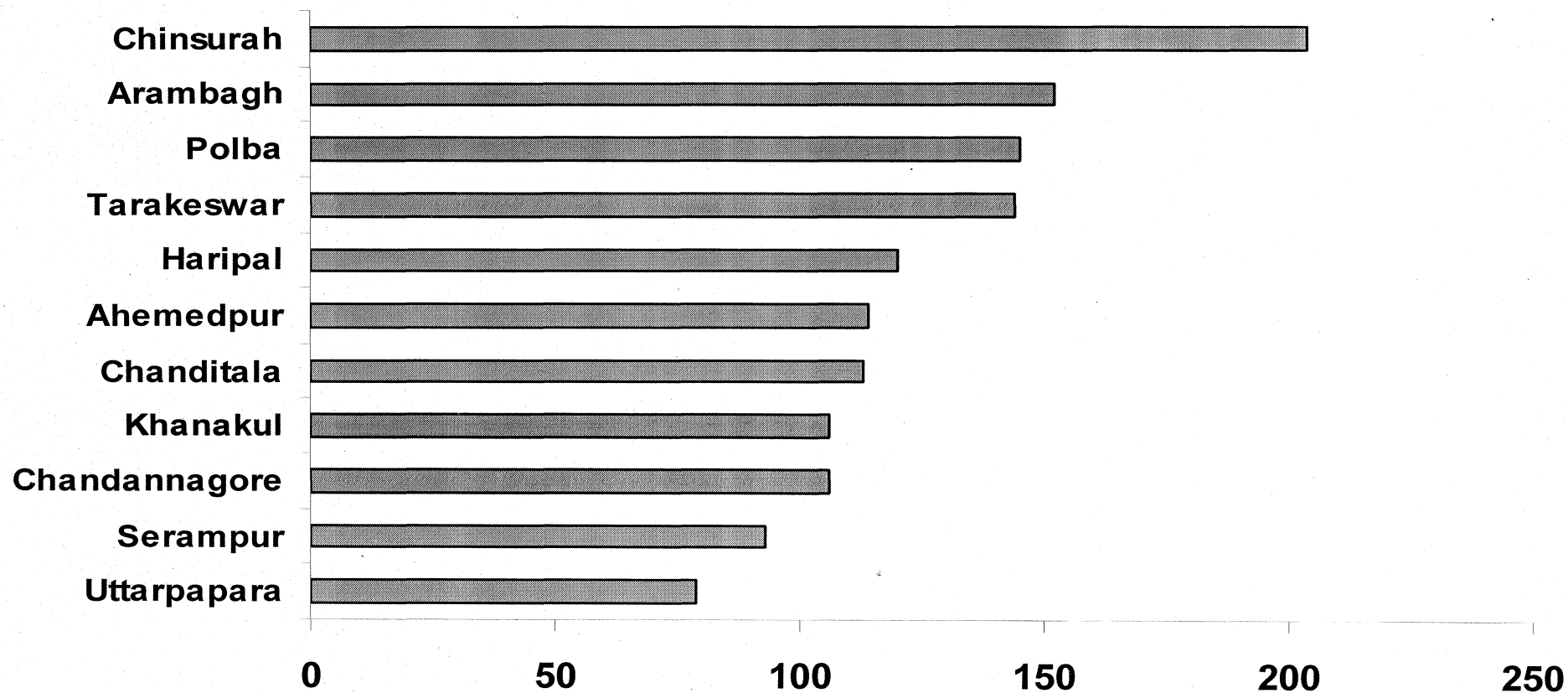
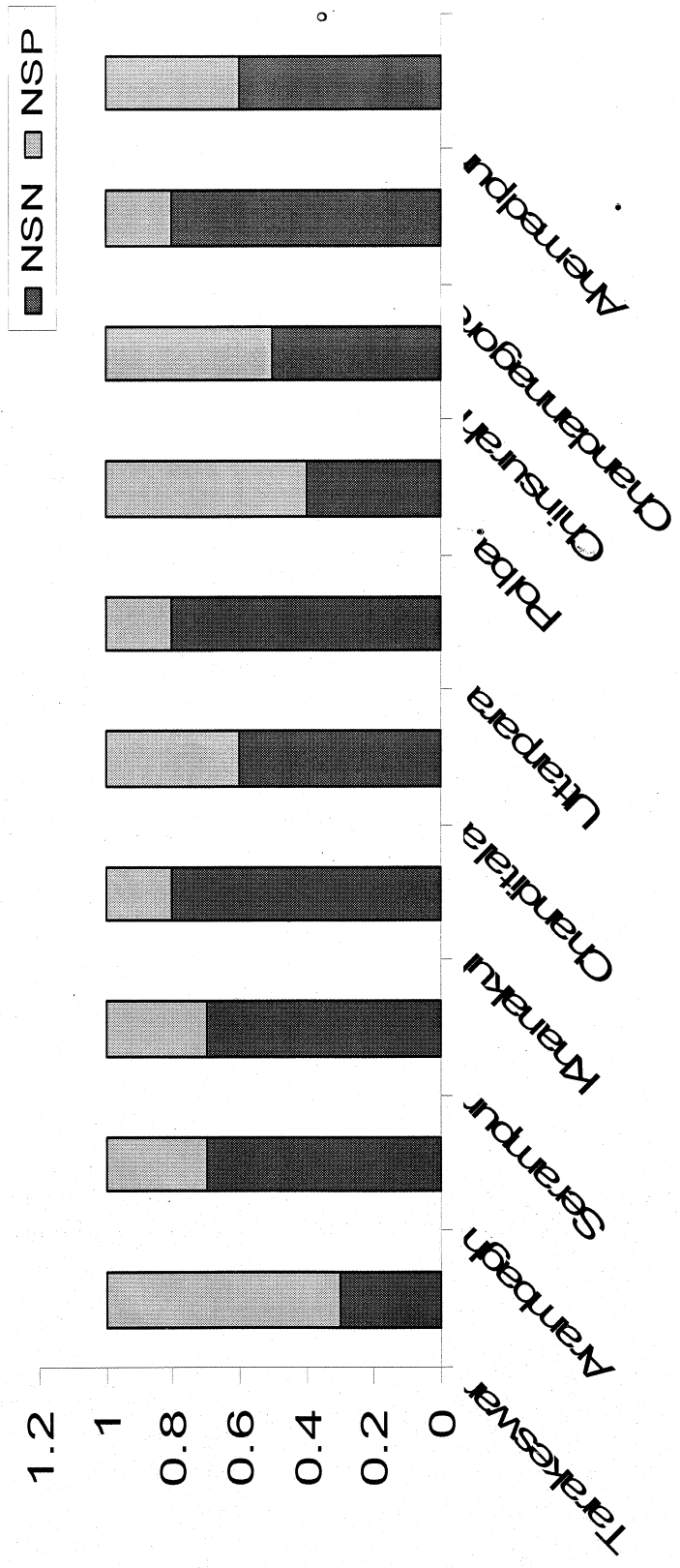


Figure-6: NSP: NSN ratio, Tuberculosis unit wise, Hooghly district. 2002 to 2006



SECTION-2

SECOND FIELD POSTING

2.1 Evaluation of Acute Flaccid Paralysis Surveillance in Hooghly district, West Bengal, India, 2008.

Introduction:

In May 1988, members of the 41st World Health Assembly (WHA) passed a resolution calling for the global eradication of poliomyelitis by the year 2000 as part of global polio eradication initiative.¹ Poliomyelitis has been eliminated from most of the countries in last eighteen years. By the end of 2000, 10 out of 11 member states of the WHO South-East-Asia Region had interrupted wild Poliovirus transmission as a part of global eradication efforts. India, Pakistan and Afghanistan however continued to report poliomyelitis cases. Bangladesh reported 18 cases after five years of non-polio state in 2006 though all cases were imported and no active transmission was reported. Bangladesh is still considered a non-endemic country by the World Health Organisation.⁴ By the end of 2006, cases of poliomyelitis were reported only from seven countries like Nigeria, India, Pakistan, Somalia, Afghanistan, Namibia, Bangladesh and Niger. Ninety percent of these cases are linked to the polio “hot spots” in India and Nigeria.³

Strategies for Polio eradication are (1) achieving and maintaining high routine coverage in infants younger than one year with at least 3 doses of oral polio vaccine (OPV 3), (2) administering supplemental doses of OPV to all children aged below 5 years during National Immunization Days (NID) to rapidly interrupt

transmissions, (3) surveillance of Acute Flaccid Paralysis (AFP) cases and (4) conducting “mop –up” vaccination campaigns.²

The National Polio Surveillance Project (NPSP) was launched in India in 1997. The number of polio cases reported from India decreased from 1934 in the year 1998 to 268 in 2001. However, there was a large outbreak of polio in 2002 when 1600 cases were reported. In 2005, only 66 cases from 35 districts were reported in India. But in 2006 and 2007 there was resurgence with 676 and 860 cases mostly from the cases from Uttar Pradesh and Bihar (till 8th February, 2008).⁵ Investigations of the 2007 epidemic indicated that a combination of low routine immunization coverage and an insufficient polio campaigns had led to an accumulation of susceptible children, especially in the states of Uttar Pradesh and Bihar. India has achieved significant progress in reducing transmission of wild poliovirus type 1 (WPV1) in 2007. But there has been an increase in cases of the other circulating strain - wild poliovirus type 3 (WPV3) - which has reinfected Bihar after three years. This increase and spread of WPV3 was anticipated in view of the immunization strategy focusing on WPV1 by using mostly mOPV1 since 2005.⁶

In Hooghly district of West Bengal, the last case of polio was reported in 2003. The challenges for surveillance of acute flaccid paralysis in the district included threats of transmission of poliovirus from the adjacent Bhagalpur district of Bihar state Burdwan district of West Bengal where cases of polio have been reported in 2007.⁷ In view of these challenges, we evaluated the surveillance system for

polio in the Hooghly district. The objectives of the evaluation were to (1) compare the performance indicators of district at different levels with the standards of the National Polio Surveillance Project and (2) examine various attributes of the surveillance system.

Methods:

Description of the existing AFP surveillance system: To describe the surveillance system we reviewed the NPSP guidelines and interviewed key stakeholders.

Evaluation of surveillance system: We used the framework proposed by the Centres for Disease Control and prevention (CDC) to review the attributes of a surveillance system.⁴ We considered the following attributes to evaluate the surveillance system. We focused on the weekly reports of AFP surveillance of all the 30 reporting units for 2003-2007. We used the following indicators to assess various attributes of the surveillance system of acute flaccid paralysis (Table 1).

(1) Simplicity: Proportion of health assistants who used the case definition of acute flaccid paralysis and proportion of Medical Officers, Public health nurses who had the knowledge of collection and transportation of stool specimen.

(2) Acceptability: Proportion of health centres providing reports each week. This was assessed for 52 weeks in 2007.

- (3) Sensitivity: As per the NPSP guidelines, 2 cases of AFP will occur among 100,000 children aged 15 years or less. To evaluate the sensitivity, we calculated the AFP rate in the district and compared with the expected rate.
- (4) Positive predictive value: Proportion of AFP cases with 2 adequate stools taken reported poliomyelitis
- (5) Representative ness: Proportion of reporting units reporting acute flaccid paralysis
- (6) Timeliness: (a) Proportion of AFP cases notified with 14 days of onset (b) interval between notification of a suspected case and starting of investigation and (c) proportion of AFP cases followed up of cases at 60 days.
- (7) Flexibility: Qualitative assessment of whether the surveillance system could be used for measles surveillance.

Data collection:

The information required for calculating the above mentioned attributes was collected through (1) interviews in semi structured questionnaires of randomly selected health workers at sub centers, health facilities and district officials conducted during September 2007 and (2) review of surveillance records and reports during the period 2003 to 2007 available at health facilities, hospitals and district. We included all the 30 reporting units of acute flaccid paralysis in district Hooghly in sampling frame.

To evaluate sensitivity, acceptability, representativeness, timeliness, predicted value positive and flexibility we visited the National Polio Surveillance office and all reporting units. We collected surveillance data and records for the period 2003 to 2007.

To evaluate simplicity of surveillance system we interviewed health assistants working in 62 of the 660 sub-centres. This sample size was calculated based on the following assumptions: 50% Health assistants are using the correct case definition of acute flaccid paralysis for reporting, confidence coefficient of 95% and with confidence interval of $\pm 10\%$. To select these sub-centres, we sorted blocks alphabetically and listed sub-centres alphabetically. We selected the first sub-centre by simple random sampling. We selected subsequent sub-centres by population proportionate to size method. We interviewed the health assistant (female) of selected sub-centres by pre-tested questionnaire (in local language). We also interviewed one Medical Officer and one Public Health Nurse from each of the 30 reporting units.

The principal investigator and his team, who was trained in July, 2007 in the method, conducted all interviews at reporting units and sub-centres level. We analysed data using Excel and EPI 6.

Results:

Description of surveillance system: The acute flaccid paralysis surveillance is one of the key elements of the strategy for polio eradication. The Ministry of Health and Family Welfare recognized the need to expand and maintain a surveillance system that can monitor the impact of pulse polio immunization and

identify areas to focus supplemental immunization in the end stage of eradication. In this connection in 1997, National Polio Surveillance Project (NPSP) was established as a joint collaboration between the World Health Organization and Ministry of Health and Family Welfare, Government of India, with the primary objective to intensify surveillance for polio eradication through detection and investigation of childhood acute flaccid paralysis (AFP). NPSP with a central unit provided guidance, support, co ordination, and monitoring and data analysis of various activities related to surveillance of polio. The Surveillance Medical Officers headed the NPSU field units. In Hooghly district, a network of 30 reporting units, which includes health facilities and hospitals, did stimulated passive surveillance of acute flaccid paralysis to see possible acute flaccid cases.

Population under surveillance for AFP: Cases of polio have been reported from adjacent districts in the state as well as Bihar. Children under the age of 15 years (N=14, 67,400) are under surveillance in Hooghly district.

Case definitions: The following case definitions are used in AFP surveillance:

Suspected AFP case: A case of acute flaccid paralysis is defined as sudden onset of weakness and floppiness in any part of the body in a child < 15 years of age or paralysis in a person of any age in whom polio is suspected.

Confirmed Polio cases: An AFP case is confirmed as polio only by the isolation of wild poliovirus from any stool specimen.

Compatible Polio cases: When there is inadequate stool specimen with no wild polio-virus isolated with residual weakness.

Discarded / non-polio AFP case: When there is adequate stool specimen with no wild polio-virus on examination without any residual weakness.

Cases should not be included as AFP if there is no evidence of weakness and floppiness at the time of examination or any time during the course of illness or if the onset of paralysis is more than 6 months prior to notification. The non-polio causes of AFP, includes mainly Guillian-Barre syndrome (GBS), Transverse myelitis, injection neuritis and Traumatic neuritis account for this background rate, regardless of whether acute poliomyelitis exists in the community or not. It is estimated that at least one case of non-polio acute flaccid paralysis occurs for every 100,000 children aged less than 15 years per year as a result of background rate.

Types of system: Both stimulated passive and active surveillance were carried out. Usually it is a passive surveillance. Multipurpose health worker were reporting cases from their sub-centre areas as per case definition to block public health nurse (BPHN) of the respective block. BPHN was reporting cases to Surveillance Medical Officer (SMO) & District Immunization Officer (DIO) in the district for clinical examination as early as possible. Two stool samples were collected 24 hrs apart for virological examination. Stool samples were collected within 14 days as per guideline.

Data structure: Each of 30 units in Hooghly district reports weekly, even when no case of acute flaccid paralysis has been identified (zero reporting). These

thirty reporting units were from 18 BPHC/Rural hospitals, 5 SD/SG and district and 7 municipality health clinics and urban health centre. Though block primary health centres and hospitals are main reporting units, all private practitioners, health workers, anganwadi workers and traditional birth attendance are encouraged for acute flaccid paralysis reporting.

Feedback: The nodal officer of the reporting unit is responsible for reporting case of acute flaccid paralysis to the District Maternal & Child Health Officer / Surveillance Medical Officer using the quickest possible means (telephone/ fax) at Weekly Report Form (AFP-H002) on Monday of every week. However, verbal communication be followed by written information as soon as possible. The District Maternal and Child Health Officer records all reported acute flaccid paralysis cases in a standard line-listing format. The District Immunization Officer of each district collects the AFP- H002 forms from all the reporting units collates them in the AFP- D002 form and compiles and transmits this information in the AFP-D001 form to the State EPI Officer / Regional Coordinator on the Tuesday of each week. State EPI Officer then report weekly to the national level. On Wednesday, the State EPI Officer / Regional Coordinator collect the information received in the AFP - D001 forms and the line lists all the district reports in the state. He collates the district reports received in the AFP S002 form and prepares the state report in the S001 form. The State EPI Officer transmits same to the Assistant Commissioner (Immunisation), Ministry of Health and Family Welfare, Government of India, New Delhi on every Wednesday. Assistant Commissioner

(Immunisation), Ministry of Health and Family Welfare, Government of India, New Delhi to the WHO's South East Asian Regional Office (SEARO) at New Delhi on every Thursday (Fig 1).

Action taken: All reported cases of acute flaccid paralysis are investigated by DIO and SMO within 48 hours of notification, for confirmation of the presence of acute flaccid paralysis and to obtain stool specimen for laboratory investigation. The DIO and SMO fills laboratory request form, send specimen to laboratory and conducts active search. All relevant information gathered in standard form and transmitted to the state immunization officer. The DIO and SMO re-visit every case of acute flaccid paralysis within 60 days after onset of paralysis to determine the presence or absence of residual weakness.

Evaluation of AFP surveillance system:

Simplicity: Of 62 health assistants interviewed, 57 (92%) know the case definition of acute flaccid paralysis to report cases. All the 30 medical officers and 23 public health nurses (18 from Block & 5 from PP units) had the knowledge of case definition, collection and transportation of stool specimen.

Acceptability: All the 30 reporting units (100%) sent the weekly reports regularly to district for all the 52 weeks.

Flexibility: Since 2007, the AFP surveillance network in the district is conducting measles surveillance to identify cluster of measles cases and their investigation.

Sensitivity: The reported rate of acute flaccid paralysis per 100,000 children <15 years ranged from 1.06 per 100,000 (2003) to 5.32 per 100,000 (2007).

According to NPSP guidelines, operational target for AFP rate is 2 per 100,000 children aged <15 years. During 2003, the AFP rate was less than operational target of 2 per 100,000 (Table 2 & Fig 2). The acute flaccid cases were not reported uniformly through out the district. During 2007, the AFP rates of seven reporting units were less than 2 per 100,000 of which three reported no AFP case (Fig 4).

Positive predictive value: Of the total AFP cases detected during 2003-2007, two stool samples were collected from 82-89% of the cases within 14 days (fig-3). One only case was found to be due to wild poliovirus in 2003. (Table-2)

Timeliness: There are 30 reporting units in the Hooghly district. All the multipurpose health workers of these 18 blocks including one district hospital and 4 SD/SG hospitals and 3 ESI hospitals sent weekly and 5 urban health centres of municipalities' reported to the district family welfare office and NPSP office on every Tuesday as per NPSP guideline. During 2007, all the reports for 52 weeks were received in time either by special messenger or over telephone. In 2007, two stool samples were collected from 89% of the AFP cases within 14 days (Figure-3). 80-89% of the cases were notified to the district authorities within 10 days of the onset. The interval between case notification and investigation was 1-7 days (median 1 day). The proportion of stool specimens sent for laboratory examination ranged from 94% (2007)-97% (2002). Sixty days follow up of AFP cases done 98% in 2002 to 2007 (Table 2).

Representative ness: 98% (1530/1560) of reporting units reported in time during all the 52 weeks of 2007. Three reporting units did not report any AFP case in 2007 (fig-4).

Discussion:

There are several ways of assessing the quality of polio surveillance. The two most important criteria from a programmatic point of view are (1) reported rate of acute flaccid paralysis per 100,000 children <15 years of age and (2) proportion of acute flaccid paralysis cases having adequate stool collected within 14 days. AFP rate in the district during 2002 to 2007 was well above the expected annual rate of two per 100,000 children <15 years expect 2003. In 2007, the AFP rates of seven reporting units were less than 2 per 100,000. Adequate stool was collected from majority of AFP cases detected by the surveillance system within 14 days.

In 2007, though the AFP rate of the district was adequate, three reporting units reported zero AFP cases while four had rates less than 2 per 100,000. Surveillance activities need to be strengthened in these reporting units.

The surveillance system in the district was representative as all the reporting units sent the AFP reports to the district. At the reporting units, medical officers and public health nurses had correct knowledge of stool sample collection from AFP cases and transportation to appropriate laboratory. We assessed the timeliness by considering (1) proportion of health facilities reporting each week in time and (2) interval between onset of case and notification to district authorities.

Most of the reporting units reported in time for all the 52 weeks reflects high standard of timeliness in reporting. An improvement however is necessary to reduce the time for reporting between onset of case and its notification. It is also necessary to increase the proportion of AFP cases with two stool samples within 14 days.

Surveillance for acute flaccid paralysis is flexible for integration with other programme, including the integrated disease surveillance programme. A flexible surveillance system can adapt to changing information needs or operating conditions with little additional time, personnel, or allocation of funds and since 2007 the AFP surveillance adopted measles surveillance. Use of the infrastructure and reporting mechanism is very worthy and time saving so far for the integrated disease surveillance programme.

In conclusion, the polio surveillance system was sensitive, timely, flexible and representative. This has contributed to the achievement in polio eradication status in the district Hooghly, West Bengal in the last five years. Based on the findings of our evaluation we propose the following recommendations. First, improve the sensitivity of AFP surveillance in seven blocks where AFP rates were less than two. Second, maintain the existing timely³ and sensitive surveillance system of acute flaccid paralysis in the final lap of polio eradication. Third, conduct intensive active case search and submit stool sample in time in blocks with poor surveillance indicators. Fourth, hold advocacy meetings for the medical community and the network of village doctors for building awareness to increase the AFP case detection.

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Figure 1: Flow chart showing feedback mechanism of AFP surveillance.

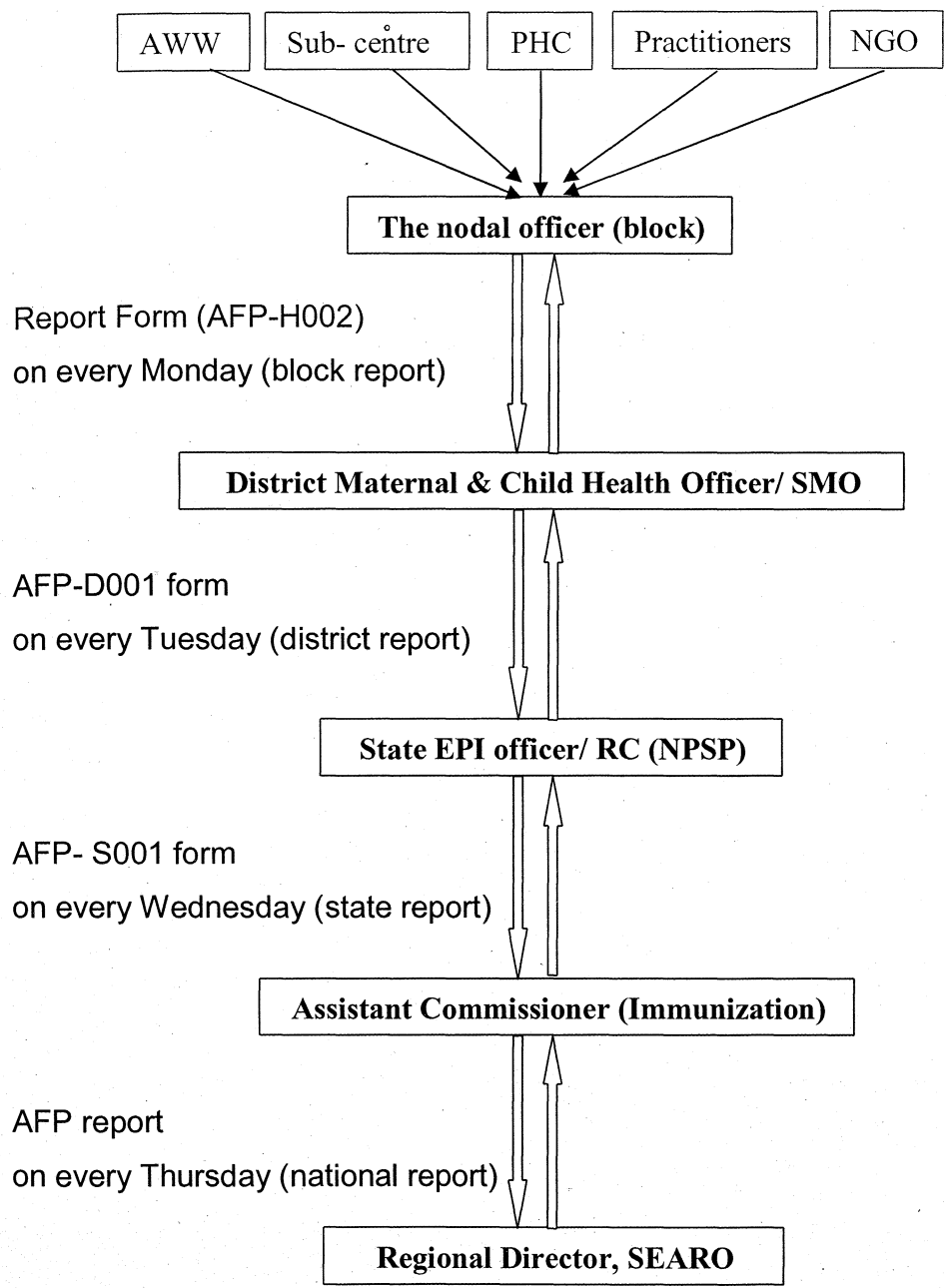


Table-1: Logical frame indicating surveillance attribute indicators corresponding to different strategies of surveillance of acute flaccid paralysis, Hooghly district, West Bengal, India, 2007.

Surveillance attribute	Case reporting	Case investigation
Sensitivity	No. of acute flaccid paralysis cases per 100,000 under 15 population	
Positive predictive value		Proportion of AFP cases with 2 adequate stools taken within two weeks after paralytic onset
Representative ness	No. of site reporting acute flaccid paralysis	
Timeliness	Interval between onset and notification	Interval between notification of a suspect case and investigation Interval between specimen dispatch and receipt at laboratory Follow up of cases at 60-70 days
Simplicity	No. of health assistant use the case definition of acute flaccid paralysis	
Acceptability	No. of health centre providing reports each week	
Flexibility	Qualitative assessment of whether this could be used for measles	

Table-2: PERFORMANCE INDICATORS OF AFP SURVEILLANCE IN HOOGHLY

YEAR	Expected Non-Polio AFP	AFP reported	Inv. Within 48 hours	%	% 2SS within 14 days	% Notification within 10 days	Follow up Due	Follow up done	%	Confirmed Cases	Compatible Cases	Discarded Cases	Total AFP Rate	NP AFP Rate
2003	18	12	19	100	89	89	19	17	89	1	0	18	1.06	1.00
2004	18	36	45	98	78	80	21	21	100	0	3	43	2.56	2.39
2005	18	47	80	90	80	82	19	19	100	0	0	89	4.94	4.94
2006	18	66	96	90	81	83	24	24	100	0	2	105	5.94	5.83
2007	18	47	31	89	89	83	4	4	100	0	0	21	5.32	3.19

Figure-2: Reported rate of acute flaccid paralysis (AFP/100000 <15 population), Hooghly district, West Bengal, India, 2003 – 2007

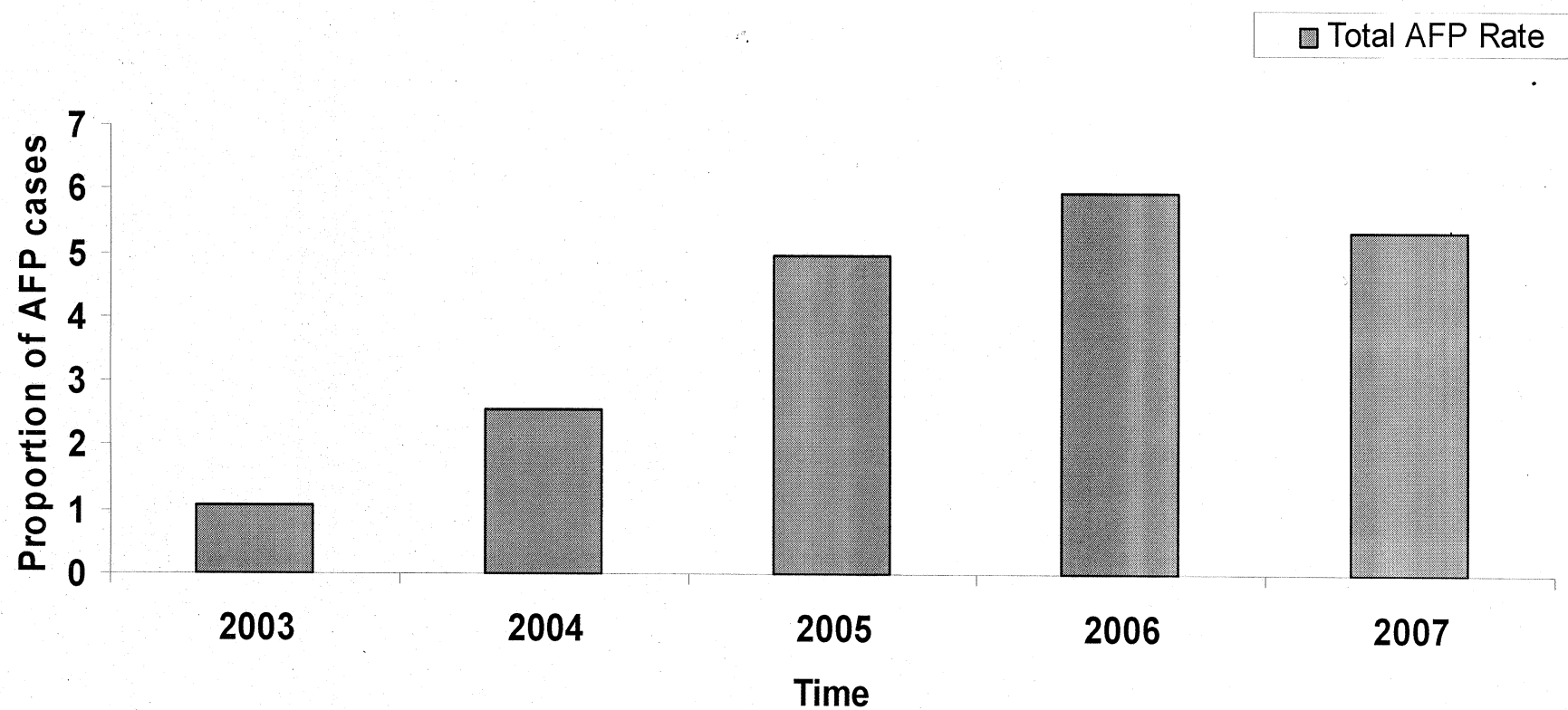


Figure-3: Timeliness of collection of two stool samples within 14 days of case notification, acute flaccid paralysis surveillance, Hooghly district, West Bengal, India 2003 - 2007

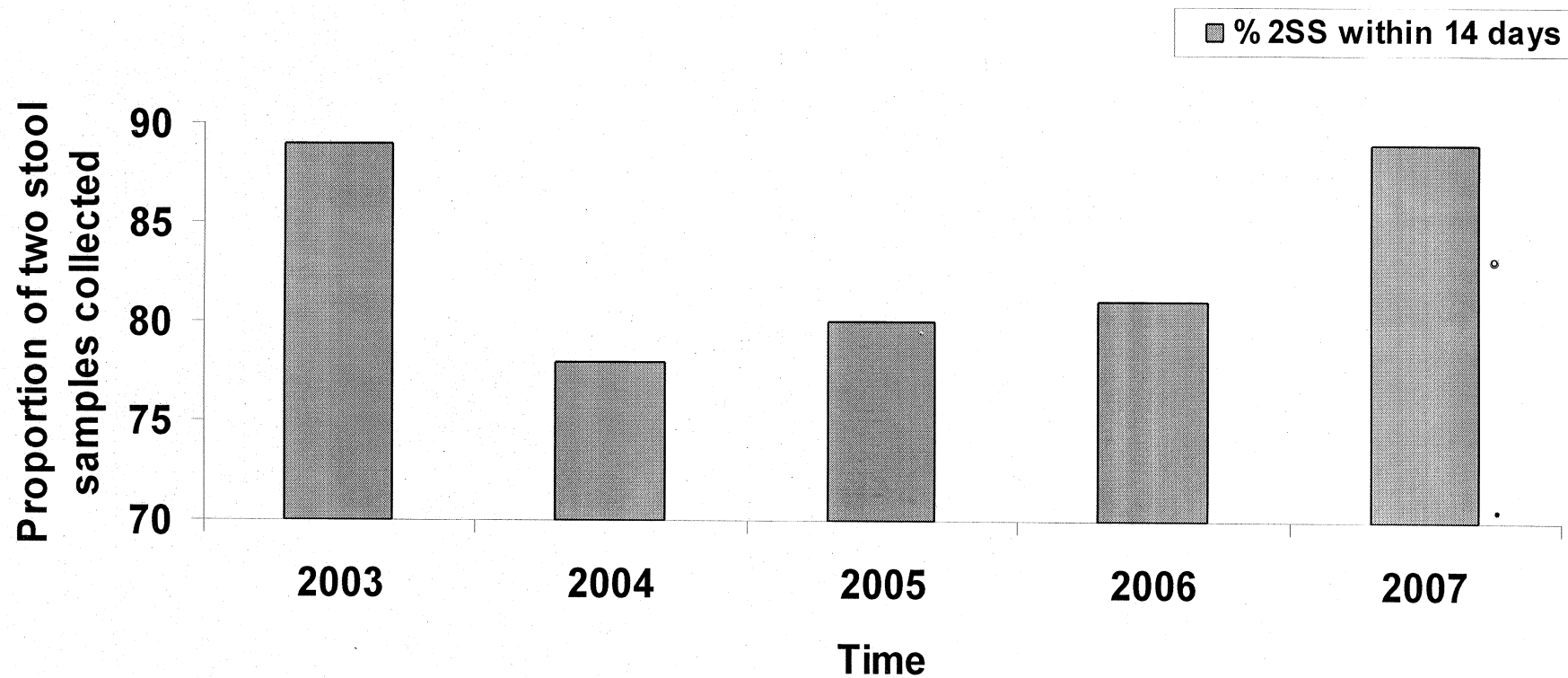
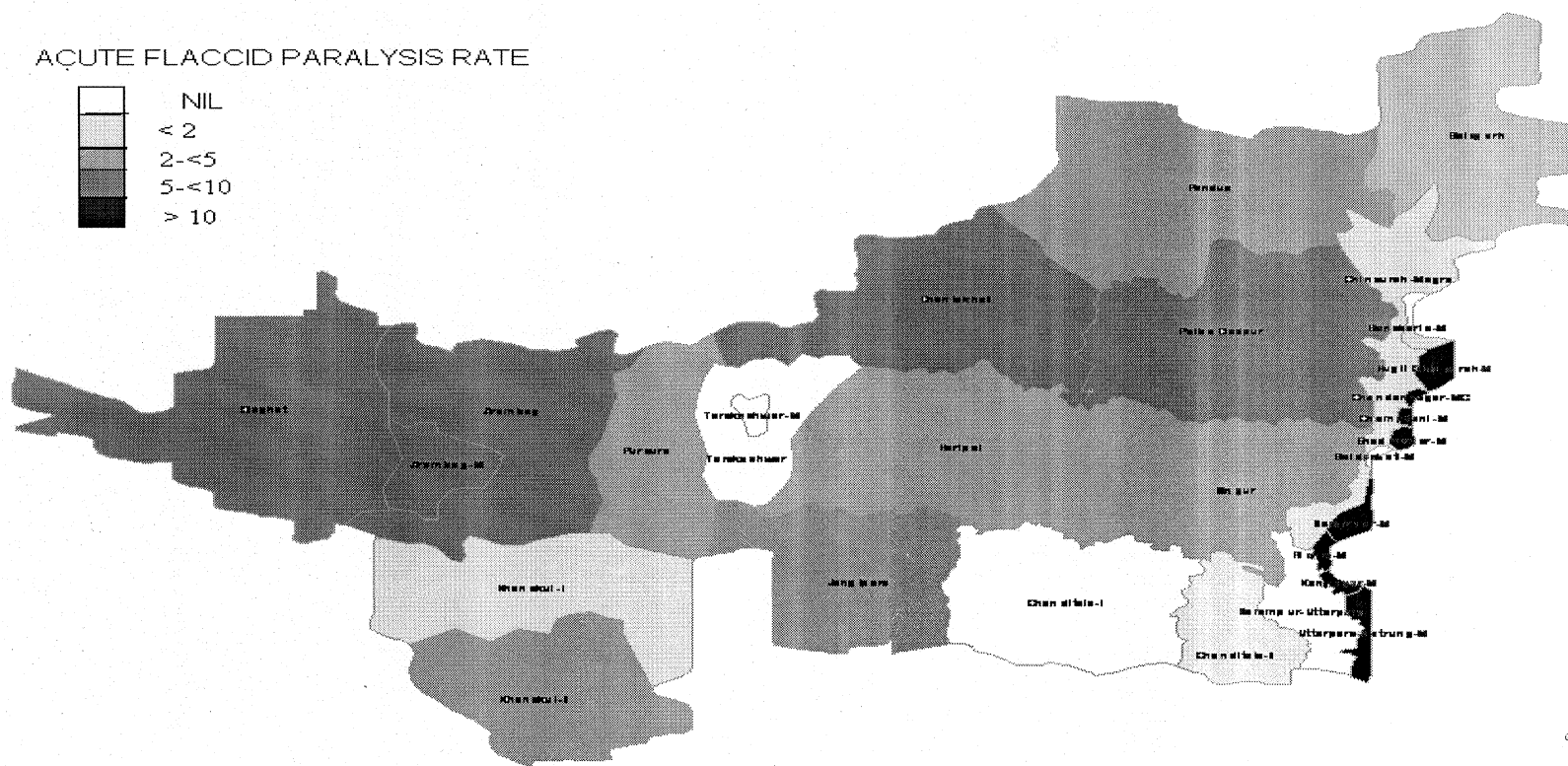


Figure-4: Reporting unit wise acute flaccid paralysis rate, Hooghly, West Bengal, 2007



2.2 Evaluation of Revised National Tuberculosis Control Programme (RNTCP) in Hooghly district, West Bengal, India, 2008

Introduction:

Tuberculosis is a chronic infectious disease requiring prolonged treatment. About one third of the world's population or 2 billion is infected by Mycobacterium Tuberculosis.¹ World wide, tuberculosis is the second common cause of death attributable to a single infectious agent. 9.2 million new TB cases occurred globally and 1.7 million people died due to TB in 2006.³ TB accounted for a loss of 46.5 million DALYs (Disability Adjusted Life Years) globally.⁴ It was 3.4% of the total DALYs loss in the world. 95 % of TB cases and 98 % of TB deaths are in developing countries.⁶ The South-East Asia Region accounts for nearly 38% of the world's tuberculosis cases with three million new cases and nearly 750 000 deaths occurring annually.⁷ Approximately 1.8 million people in India develop tuberculosis every year. Out of this about 0.8 million are new smear positive highly infectious cases. Despite being completely curable, TB kills more than 400,000 people every year.² Multi drug-resistant TB (MDR-TB) was found in 2.4% of new cases and in 16.9% of re-treatment cases.^{8,9} 5% of all new cases are MDR in India. Every year TB costs India more than \$ 3 billion.¹²

Revised National TB Control Programme was pilot tested in 1993 in India and full-fledged programme was started in 1997.⁵ India is the second largest in DOTS programme in the world. It was based on the directly observed treatment strategy (DOTS) with the target of 70% case detection, 85% cure rate and 90% sputum conversion rate. Implementation of the Global Plan is expected to reverse the rise in incidence globally by 2015, as specified by the eight Millennium Development Goals (MDGs) target.⁸

West Bengal has new sputum smear positive case notification rate of 87% and cure rate of the above 85% though the level of performance is not uniform throughout the state. High default rate in the retreatment sputum positive cases is a matter of concern.⁸

Revised National TB Control Programme started in Hooghly district as a pilot project in the year 1995 covering a population of 450,000. In spite of the adequate infrastructure and the programme in place for last 13 years, secondary data analysis revealed that the district is still lacking in case detection objective. In 2nd quarter 2007, new sputum smear positive case notification rate was 54/100,000 and Annualized total case notification rate is 130 / 100,000, which were far behind the global target of 142 / 100,000.² We evaluated the programme with the objectives of (1) reviewing the input, process, output and outcome of RNTCP in the district. (2) Independently assessing strengths and weaknesses of RNTCP implementation (3) Assessing the accuracy of records and reports and (4) formulate recommendations to strengthen the programme in respect of poor case detection in the district.

Methods:

Description of the programme: We reviewed in detail the documents including WHO guidelines and operational manual of the RNTCP. We also discussed on different operational issues of the programme with programme managers, health facilities, and sub center level.

Evaluation of the programme: RNTCP is implemented in the district through eleven TUs, 57 DMCs, 703 DOT centers and 771 DOT providers. We followed the evaluation methodology followed in RNTCP to assess the input, process, output and outcome indicators of the programme (Table 1). We selected all the TUs and 39 of the 57 functioning DMCs. Of the 703 DOTS centers in the district, we selected 59 DOTS centre by simple random sampling method. We assessed the 11 TUs, 39 DMCs and 59 DOTS centers for logistics and performance.

We interviewed 43 medical officers, 11 MO-TC, 11 STS, 11 STLS, 2 Tuberculosis health volunteers (TBHVs), 39 laboratory technicians and 59 DOT providers working in the 59 DOT centre, 39 DMCs and 59 DOT centers for training, knowledge, and their role and work in the programme. We reviewed the 11 TB registers, 39 laboratory registers, reports of DMCs sent to DTC, stock register of DTC and 39 DMCs. We also checked 59 treatment cards and drug boxes.

In the fourth quarter of 2006, a total of 627 NSP cases were registered whereas in 729 NSP cases were registered in third quarter of 2007. We selected 57 NSP TB patients of 3rd quarter, 2007 and 57 NSP TB patients of 4th quarter, 2006 randomly. This included 55 new smear positive (NSP) cases from the 11 TUs (five from each TU), and 59 NSP cases from 59 DOT centers (one from each DOT center) and interviewed them about the investigations and treatment. This sample size was calculated based on the assumption of 80% cure rate, +/- 10% confidence interval and 95% confidence coefficient.

Data collection: We collected secondary data from reports and registers of the TU and DMCs containing registration, diagnosis and treatment. We also reviewed reports from the selected health institutions and checked for consistency between them. We checked records of all the selected patients and crossed checked with laboratory registers. We reviewed TB register, lab register and treatment cards as quantitative methods. For qualitative data we interviewed the staff involved in RNTCP using questionnaires provided by RNTCP.

Evaluation indicators: The two important components of RNTCP are case detection and cure rate. We assessed the input, process, output and outcome of the programme for these two components.

Input: For case detection, input indicators included (1) total number of medical officers, lab technicians, and health workers post sanctioned and number in position (2) proportion of the staff trained under RNTCP and (3) proportion of DMCs having one binocular microscope, reagents. For case management input

indicators included (1) number of DOTS providers in position and (2) proportion of DOT providers trained (Table 1).

Process: For case detection, the process indicators included (1) number of supervisory visits fixed and the number of supervisory visits conducted, (2) number of trainings fixed and the number of trainings provided to government health providers, (3) proportion of TB suspects referred from the adult OPD attendees for screening, (4) proportion of suspects whose sputum was examined, (5) proportion of slides collected and cross checked. For case management, process indicators included (1) proportion of patients treated at the DOT center during intensive phase (IP) and continuation phase (CP), (2) proportion of patients and DOT providers who had knowledge about the disease, (3) Proportion of smear positive patients initiated on treatment within one week of diagnosis (Table-1).

Output: For case detection, output indicators included (1) proportion of patients who were sputum positive, (2) proportion of patients for whom three sputum smears were examined. For case management, the output indicators included (1) proportion of patients put on treatment within 7days, (2) proportion of TB patients for whom two sputum smears were done at the end of IP, (3) proportion of TB patients who had sputum examination at the end of treatment, (4) proportion of initial defaulter, (5) proportion of registration done within one month, (6) proportion of addresses of patients written in the treatment card (address verification) [Table-1].

Outcome: Our outcome indicators included (1) total case detected as against the estimated number (ACDR), (2) new smear positive case detected as against the estimated number (NSPCDR), (3) new smear positive cases that have been declared cured (cure rate), (4) defaulter rate, (5) death rate, (6) failure rate, (7) sputum positive patients converted to negative at the end of 3 month (conversion rate) [Table-1].

Results:

Description of the programme:

There is one District TB office, 11 TUs, 57 DMCs and 703 DOTS centers in Hooghly district with an estimated population of 54,90, 467 in 2007. The District TB officer (DTO) has the overall responsibility to implement the programme, budgeting and financial resources at the district level. In the TU the Senior Treatment supervisor (STS) maintains the TB register and prepares quarterly report on case finding, sputum conversion rate, treatment outcome and management of the programme. The designated Medical officers cross checks the quarterly report and submit it to the DTO. The doctors and trained laboratory technicians in the Designated Microscopy centre examines 10-15 sputum smears on an average and not more than 20-25 sputum smears per day. In the DOTS centre, DOTS is given by peripheral health staffs, such as MPWs, or through voluntary health staff such as Anganwadi workers. An honorarium of Rs 250 per patient is paid to the non-salaried DOTS providers after completing the treatment by the DTO.

Evaluation of the programme:

Input indicators: In Hooghly district, 37 of the 43 medical officers (86%), all the 39 laboratory technicians (100%), 11 STS (100%), 11 STLS (100%) and all the MPWs (100%) were trained in RNTCP. All the 57 DMCs are covered by STS and STLS (100%), and have a functional binocular microscope (100%). In the DTC, there was two functioning four-wheeler vehicle and 11 functioning two-wheeler for 11 TUs. Category wise drugs were available for three months. The required equipments and reagents were available and were in working condition at the laboratory at the Designated Microscopy Centers. All the sputum collection rooms at DMC level had running water supply. There was buffer stock of stationeries in the form of treatment cards, patient identity cards, registers; laboratory investigation forms etc. at the DMCs (Table-2).

Process indicators: Of the 3, 61,164 OPD attended during 3rd quarter of 2007 in all 11 TUs of the district, 7701 (2.1%) TB suspects were referred for sputum microscopy. The symptomatic referral of five TUs (Serampore, Chanditala, Khanakul, Arambag and Ahmedpur) was less than <2%. As per the laboratory register available at each DMC, three sputum smears were examined from all the selected 114 TB patients. Sputum smears from 100% and 98.2% of these patients were examined at the end intensive and continuation phase respectively. Of the 50 DOTS centers observed, 37 (74%) centers correctly maintained records about treatment cards and drug boxes. Fifty (84%) of the 59 treatment cards were updated by the DOTS provider. 86% of the 114

Diagnosed new sputum positive TB patients put on DOTS within 7 days were 86%. 9 DOT centres were closed at the time of survey (Table 2).

Output indicators: Of all 7701 TB suspects referred for sputum examination, 10.6% were sputum positive. 11% of the NSP cases diagnosed in 3rd quarter of 2007 were initial defaulters and were not registered. Most (99%) of new sputum smears positive cases were registered within one month (Table-2).

Outcome indicators: The total and new sputum positive case detection rate for 3rd quarter 2007 was 128/100,000 and 47/100,000 respectively. Conversion rate was 88% at the end of three months of patients registered during 2nd qtr 2007. Defaulter rates of new sputum positive patients registered in 4th quarter 2006 was 5.6 % (Expected level: <5%). Average Death rate was marginally high (5%) and cure rate was 88% (Table-2).

Interview of TB patients and DOTS providers:

We interviewed 90 of 114 patients selected. 24 patients were not found in their residence at the time of interview. All the 90 patients interviewed, said that they received free microscopy services and treatment from Govt health system. The median waiting time for TB patients was 10 minutes before they were given DOTS. The median time spent to administer a single dose of DOTS was 30 minutes. Though the DOTS timing was convenient for majority of the patients, 24% felt that thrice a week attendance at DOT center during intensive phase was not convenient (Table 3).

Of the 59 DOT providers interviewed to assess their knowledge about DOTS, 57 (96%) knew that the first dose is to be given under observation in the continuation phase and the patient has to return the empty blisters for the remaining two doses for that particular week. 45 (76%) of them knew that the follow up of the sputum examinations are to be done at two, four and six months of treatment for NSP cases, 52 (88%) knew about immediate house visit of patients who did not come for taking their scheduled dose and 48 (81%) knew about marking a circle at the date and to write reasons in the remark column if a patient does not come for taking his or her scheduled dose (Table 2). 25 (42%) of the ten DOTS providers did not receive the honorarium from the DTO for the patients who completed the treatment. 37(95%) out of 39 laboratory technicians correctly said the target cure and sputum conversion rates, number of sputum examination required for diagnosis and follow up and number of positive and negative slide to be preserved for review (Table 4).

Discussion:

We evaluated RNTCP programme in the district to find the strengths and weakness in the programme. The overall input of the programme in terms infrastructures was adequate at all levels of the health system in terms of drugs, IEC materials, vehicles, and computer. All the DMCs had working microscopes and the supply of reagents was adequate. We identified several deficiencies in the process of the programme. These included (1) low referral of chest symptomatic from the OPD patients (2) external quality assessment, (3) high initial default rate, (4) initial home visit for address verification and pre-

treatment counseling (5) defaulter retrieval activities for defaulted patients and (6) insufficient Supervision of MOs. Addressing these deficiencies will improve the performance of RNTCP in the district.

According to the RNTCP guidelines, at least 2-3% of OPD attendees should be referred for sputum examination. Though the overall symptomatic referral was adequate, for 8 TUs the symptomatic referral was less than 2% (Our secondary data analysis on TB, 2007, Page 36, Fig-4). This could be one of the reasons for low NSP and total case detection rates in the district. The annual case detection rate in the district was low (128/100,000) which probably indicates deficiencies of MOs in screening of chest symptomatic. NSPCDR was also low (47/100,000) during 2007 as against the expected target of 53/lack. In Hooghly district, 14 % of the Medical Officers did not receive any training in RNTCP. Training of Medical Officers will increase the referral of chest symptomatic and thereby the NSP and total case rate in the district. There was lack of supervision from the supervisory staff. Initial home visit was not up to the mark, which could be one of the reasons for a high initial defaulter rate in the district. The voluntary DOT providers in the district have not been receiving their incentives/honorarium for completing the treatment by the DTO. There was lack of knowledge among the DOT providers about the immediate house visit of patients who did not come for taking their schedule dose. Lack of external quality assessment in respect to Random Blinded Rechecking (RBRC) will hamper the quality microscopy activities in the district and will lead to over diagnosis of suspected TB patients.

On the basis of our findings, we recommend to (1) arrange updated training programme for all the Medical Officers and other key staffs involved in RNTCP, (2) Ensure adequate referral of chest symptomatic from the outpatient department for sputum microscopy by motivating doctors and health workers, (3) increase initial home visit, (4) Strengthen defaulter retrieval activities, (5) Give top priority to make treatment observation more convenient to patients, (6) Maintain the quality of EQA and RBRC and (7) strengthen the supervision from supervisory staff in the district.

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The logic model (Table-1)

Input	Indicator	Method	Source
Case detection			
Staffing	Proportion of trained MOs, MPWs, LTs and DOT providers in position	Semi structured questionnaire	DTO
Medicines of all categories	Medicine with buffer stock of 1-3 months	Reviewing stock register	DTO
BM and Lab reagents	Proportion of DMCs having one binocular microscope and lab reagents	Reviewing stock register	DTO
Vehicle and two wheeler	No. of vehicles and two wheelers in position in DTC and TUs	Semi structured questionnaire	DTO
Running water	sputum collection rooms had running water supply	Semi structured questionnaire	DMC
Case management			
DOT providers	Proportion of trained DOT providers in position	Semi structured questionnaire	DTO

Process	Indicator	Method	Source
Case detection			
Training	Proportion of training conducted	Review of records and training register	DTO
Supervision	Proportion of supervisory visits conducted	Reviewing of Supervisory register	DTO
Quality control activities	Proportion of slides collected and cross-checked	Semi structured questionnaire and EQA register	DTO
Referral	% of adult chest symptomatic referred	Reviewing Out patient register and referral slip	OPD, DMC
Sputum examination	Proportion of suspects whose sputum examined	Reviewing Lab register	DMC
Lab Registration	Addresses of all patients written in the lab register	Reviewing Lab register	DMC/PHI
Case management			
Treatment initiation	Proportion of smear positive patients initiated on treatment within one week of diagnosis	Reviewing Tuberculosis register	DTO and TU Office
Treatment	Proportion of patients treated at the DOT center during intensive phase (IP) and continuation phase (CP)	Reviewing Tuberculosis register and treatment cards.	DTO and TU Office
Knowledge	Proportion of patients and DOT providers who had knowledge about the disease.	Semi structured questionnaire	DOT centre and patients

Output	Indicator	Method	Source
Case detection			
Detection	proportion of patients who were sputum positive	Reviewing PHI monthly report and TU Quarterly reports	DTO and TUs
Sputum Examination	proportion of patients for whom three sputum smears were examined	Laboratory Register and treatment card	DTO and TUs
Case management			
DOTS	Proportion of new smear positive put on DOTS within 7 days	Reviewing Quarterly reports and TB register	TU Office
Follow-up and Treatment monitoring	Proportion of patients whose two sputum were examined at the end of IP	Laboratory Register and treatment cards	TU Office
	Proportion of patients whose two sputum were examined at the end of CP	Laboratory Register and treatment cards	TU Office
Defaulter	Proportion of initial defaulter	Reviewing Quarterly and TU reports	TU Office
Initial home visit	Proportion of address verification	Treatment cards	TU Office
Registration	Proportion of registration done within one month	Reviewing TB register	TU Office

Outcome	Indicator	Method	Source
Case detection			
ACDR	Proportion of total cases detected/1L population	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
NSPCDR	Proportion of new smear positive case detected	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
Case management			
Cure rate	Proportion of new smear positive cases that have been declared cured	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
Conversion rate	Proportion of new smear positive cases who converted to smear negative at the end of 3 months	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
Defaulter Rate	Proportion of TB patients defaulted	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
Death rate	Proportion of TB patients died	Reviewing of PHI, TU and Quarterly reports	DTO and TUS
Failure rate	Proportion of failure TB patients	Reviewing of PHI, TU and Quarterly reports	DTO and TUS

Table – 2: selected indicators of the Revised National Tuberculosis Control Programme evaluation, Hooghly district, West Bengal, India, 2008

Component	Indicators	n /N	%
Input	Medical officer trained in RNTCP programme	37/43	86
	LT trained in RNTCP programme	39/39	100
	MPWs trained in RNTCP programme	771/771	100
	Proportion of trained DOT providers	59/59	100
	Medical officer had knowledge in RNTCP	43/43	100
	Medicine and Lab consumables with buffer stock of 1-3 months	51/51	100
	Proportion of DMC having one Binocular microscope	39/39	100
	buffer stock of stationeries and different forms in 11 TUs	11/11	100
	No. of vehicles and two wheelers in position in DTC and TUs	2/2 & 11/11	100
	All the sputum collection rooms at DMC level had running water supply	39/39	100
Process	Adult chest symptomatic referral in 3 rd quarter, 2007	7701/361164	2.1
	Record of their initial sputum examination at the laboratory register	114/114	100
	Sputum examination results at diagnosis consistent between the laboratory register and TB register (n=114)	114/114	100
	Two sputum smears examined at the end of intensive phase	114/114	100
	Sputum examination results at the end of intensive phase consistent between the laboratory and TB register (n=114)	114/114	100
	Sputum examination results at the end of continuation phase consistent between the laboratory register and treatment cards (n=112)	112/114	98.2
	Proportion of slides collected and cross-checked(5*39= 195)	195/195	100
	Diagnosed new sp. positive TB patients put on DOTS within 7 days	49/57	86
	DOT providers maintaining a patient-wise t/t card , drug box satisfactorily	37/50	74

Output	DOT centers having clean water, sitting arrangements, water cup	34/50	68
	Doses used in the drug box consistent with marking in treatment cards	52/59	88
	Updating of treatment cards done at the time of DOT	50/59	84
	Empty blister packs in the drug box consistent with marking in their treatment cards	42/59	71
	Maintain stock register of drugs and lab. reagents	16/39	41
	Proportion of training conducted for the workers in RNTCP in 3 rd quarter	4/5	80
	Proportion of sensitization programme and patient provider meeting held	14/16	88
	Proportion of total supervisory visits conducted in 3 rd quarter,07	78/88	89
	Three sputum samples examined before start of treatment as per register	114/114	100
	Designated microscopy centers were giving high false positive and high false negative results during 3 rd quarter, 2007	5/39	12
	Inconsistency in records of gradation of sputum examination results by Laboratory register and Tuberculosis register (n=105)	3/105	3
	Sputum positivity rate	823/7701	10.6
	Proportion of initial defaulter in 3 rd quarter 2007	70/670	11
	New sputum smear positive cases were registered within one month.	598/600	99
	Treatment cards having records of address verification	52/59	88
	Treatment cards having records of defaulter retrieval activities	33/59	56
Outcome	ACDR in 3 rd quarter 2007	128/100,000	
	NSPCDR in 3 rd quarter 2007	47/100,000	
	Cure Rate in 3 rd quarter 2007		88
	Conversion Rate in 3 rd quarter 2007		88
	Defaulter Rate in 3 rd quarter 2007		5.6
	Death Rate in 3 rd quarter 2007		5

Table 3: Summary of selected indicators of RNTCP based on interview of patients, Hooghly district, West Bengal, India, 2007 (n=90)

Indicator	#	%
Patients receiving free microscopy services	90	100
Patients provided 3 sputum samples at the start of treatment	77	86
Two sputum exam. was done at the end of intensive phase (IP)	90	100
Patients who had provided two sputum samples at the end of treatment	90	100
Patients receiving free treatment	90	100
Patients whose treatment was started more than 7 days after diagnosis	0	0
Patients aware of the importance of taking treatment under observation	76	85
Patients aware of the duration of their treatment	76	85
Patients received weekly dose under supervision in IP	81	90
Patients received weekly dose under supervision in IP	57	63
Patients reporting history of previous anti-TB treatment	34	37
Patients receiving at least 20 of 24 doses under direct observation during IP	81	90
Patients having children under 6 who had not been put on chemoprophylaxis	14	16
Patients reporting that they found the location of DOT center convenient	72	80
Patients reporting that they found the timing of DOT convenient	72	80
Thrice a week attendance at DOT center during intensive phase was not convenient	22	24
Among patients, whose two sputum samples examined at the end of treatment	90	100
Patients aware of the importance of regular and complete treatment	78	87
Time for having a single dose under DOT	Median: 30 minutes	
Waiting time at the DOT center	Median: 10 minutes	
Distance covered for a single dose under DOT	Median: 1.5 Km.	
Patient spending for a single dose under DOT	Median: Rs.4.00.	

Table 4: Summary of selected indicators of RNTCP based on interview of DOT provider (n=59) and Lab technician (n=39), Hooghly district, West Bengal, India, 2007.

Indicators	#	%
laboratory technicians correctly said the number of sputum examination required for diagnosis and follow up and number of positive and negative slide to be preserved for OSE review	39	95
DOT providers had knowledge about number of doses in IP	59	100
DOT providers had knowledge that first dose is to be given under observation in CP & the patient has to return the empty blisters for the remaining two doses for that particular week.	57	96
DOT providers had knowledge that the follow up of the sputum examinations are to be done at two, four and six months of treatment for NSP cases	45	76
DOT providers had knowledge about immediate house visit of patients who did not come for taking their scheduled dose	52	88
DOT providers had knowledge about marking a circle at the date and to write reasons in the remark column if a patient does not come for taking his or her scheduled dose	48	81
DOTS providers did not receive the honorarium from the DTO	25	42

SECTION 3:

**OUTBREAK
INVESTGATIONS**

3.1 Outbreak Investigation acute diarrhoeal diseases at Uttar Para Serampur (Kanaipur) Hooghly district, West Bengal, India, 2007

Introduction:

The potential agents of gastro-intestinal illnesses include bacteria (e.g., staphylococcus aureus, bacillus, cholera, salmonella and shigella), viruses (e.g., noravirus and rotavirus) and parasites (e.g., giardia and cryptosporidia). Of these only a few pathogens cause epidemic diarrhea. In developing countries, two etiologic agents are responsible for most epidemic diarrhea: toxigenic *Vibrio cholerae*, which causes watery diarrhea, and *Shigella* species, which causes bloody diarrhea or dysentery. Typical cases like cholera are characterized by the sudden onset of profuse, effortless, watery diarrhea followed by vomiting, rapid dehydration, muscular cramps and suppression of urine. Unless there is rapid replacement of fluid and electrolytes, the case fatality may be as high as 30 to 40 percent. Epidemics of diarrhoeal diseases are characteristically abrupt and self-limiting. The incubation period is commonly 2 days. The human being is the only reservoir of this infection. Transmission occurs from one human being to another one via (a) faecally contaminated water (b) contaminated food and drink (c) person to person transmission. Epidemiological studies indicated that for about 5-10% of all acute diarrhoea cases exist in non-epidemic situation.¹ Outbreaks of Diarrhoeal diseases are common, affecting adults as well as children. The classical severe outbreaks of Diarrhoeal diseases with high

case fatality are now uncommon. The majority of infections are mild or asymptomatic. Reported cases and deaths in India in recent years also showed a declining trend in morbidity and mortality WHO (1999).²

The Hooghly district is one of the largest district of West Bengal, India with a population of 5.9 million (Census 2001) and population density 1601/sq. km. Between January 2002 and March 2007, 28 outbreaks of diarrhoeal disease were reported in the district. Of these, 1 was confirmed as cholera and 14 pond related outbreak occurred in rural areas.

On 3rd May, 2007 local panchayat reported to the Block Medical Officer of Kanaipur block that since 3rd May morning there were many persons from Basai and Dakkhinara suffering from loose motion and vomiting. BMOH immediately enquired the matter and informed district health authority. On enquiry it was observed that few people were suffering from acute watery diarrhea since 3rd May morning of which some had been admitted in the hospital due to moderate to severe dehydration. . As per instruction of the Chief Medical Officer of the district, we investigated the cluster of diarrhoeal cases with the objectives: (1) identify the causative agent, (2) identify source of infection and (3) control the outbreak and propose recommendations to prevent future outbreaks.

Methods:

Descriptive epidemiology:

We reviewed all block health department records for the present and previous years and compared the records to look for the possible outbreak. We looked

for any change in case definition, surveillance system or population influx to this area. We defined a case as acute watery diarrhea (more than one loose stool during a 24-hour period) in a resident of Basai and Dakkhinpara at Kanaipur block, Hooghly district, West Bengal, from 3/5/2007 and 17/5/2007. We searched for cases by house to house visit in those affected villages. We collected information about demographic details, area of residence, signs and symptoms and date of onset from the case patients identified. We described the distribution of cases by time by constructing epi-curve, place distribution by preparing a spot map, and person distribution by calculating age and sex specific attack rate. To generate hypothesis we interviewed few case patients to collect information regarding travel history, mass gathering in that area, water consumption, presence of food vendor in that locality, water storage and food handling practice, washing utensils and hand before food and after defecation asking the index case and some other case-patients.

Analytical study

Clustering of cases around the pond led us to generate the hypothesis that this outbreak occurred due to use of faecally contaminated pond water for drinking and other domestic purposes. To test the hypothesis, we conducted an unmatched case control study among the population of Basai and Dakkhinpara of Kanaipur block, Hooghly. We defined a case as a resident of Basai and Dakkhinpara of Kanaipur block; with acute watery diarrhoea from 3/5/2007 and 17/5/2007. We defined a control as a resident of any age of Basai and Dakkhinpara of Kanaipur block, without acute watery diarrhea, from 3/5/2007 and 17/5/2007. We prepared a pre-tested structured questionnaire to interview both cases and controls and translated in local Bengali language.

We trained the block health workers about the method of collecting the data. We calculated unmatched odds ratios and their confidence intervals (CI).

Environmental investigation:

We checked the water supply system, Tube-well supply points at the locality, and location of sewage drains. We also checked for the location of the latrine in the house. We checked pond and tube wells used by the community. We sent four water samples from different sources of the affected area to School of Tropical Medicine for testing of fecal coli forms.

Results:

• Descriptive epidemiology:

The incidence of diarrhoea recorded in the month of May ranged within .05% to .1% from 2004 to 2006. We found definite increase in incidence and clustering of cases in a resident of Basai and Dakkhinpara at Kanaipur block, Hooghly district, West Bengal, from 3/5/2007 and 17/5/2007. We identified 484 case patients (population at risk –4324) distributed over both villages with overall attack rate of 111 per 1000 population. Maximum attack rate was observed among 10-14 yrs. age group (AR-199 per 1000 population). The least affected age group was 60+ yrs age group (Attack rate 18 per 1000 population). Females were more affected (127 per 1000 population) than males (99 per 1000 population) [Table 1]. Frequency of symptoms showed

100% (n=484) cases with passage of watery stool, vomiting among 18% cases (n=91), and fever in 17 % cases (n=83). 11% of the affected people

were admitted in Kanaipur block primary health centre (n=52). The cases started occurring from 3rd May, 2007, peaked on 6th May, 2007 and 10th May, 2007, and sharply came down on 17th May, 2007. The distribution of cases suggested a common source epidemic (Figure 1). The geographical distribution showed distribution of cases was clustered around the pond (figure-2). The index case belonged to Basai. There were no common events among the residents in the area.

Laboratory investigation: School of Tropical Medicine identified 3 water samples out of 4 water samples as faecally contaminated. (1) Tap water Basai colony shows MPN of coli form: 45/100 ml (Faecal contamination present). (2) Tube well water of Basai colony shows MPN of coli form: 5/100 ml (Faecal contamination present). (3) Pond water of Basai colony shows MPN of coli form: >1800/100 ml (Gross Faecal contamination present). (4) Tube well water of Basai colony shows MPN of coli form: Nil (water is potable grade).

Environmental assessment:

Contaminated pond was being used for washing clothes, washing utensils, for bathing purposes. People were using tube-well as well as piped water for their drinking purposes. We noted from (Figure 2) that there was clustering of cases around the pond. Pond might be heavily used by the local public for multipurpose use leading to occurrence of outbreak. All houses had poor sanitary conditions and open drains. The habitats were surrounded by agricultural cultivations. People were doing open defecation and excreta were coming directly to the pond through open drains. Source of drinking water supply in the affected villages was only from nearby tube-well. We had also

observed these open drains, which were interconnected within themselves with other areas, were overflowed by rain water and going directly to the pond. Pond water was disinfected by the local panchayat and local health authority on 17th May and from then onwards the number of cases came down and after 25th May no cases had been reported. This finding supported our hypothesis further.

Analytical epidemiology:

We recruited 484 cases and 484 controls unmatched for analytical study. Significant exposures associated with acute watery diarrhoea were cleaning utensils with pond water (OR 9.5; 95% CI 7.04-12.93), pond water used for drinking purpose (OR 1.7; 95% CI 0.84-3.29), pond water used for cooking (OR 1.7; 95% CI 0.95-3.11), (Table 2). 77% of cases in the population were due to cleaning utensils in pond water and 5% drinking unpurified water and 52% of cases in population were due to washing clothes in pond water. Persons washed hand before every feed were at lower risk of contracting the disease (OR 0.3; CI 0.24-0.44) and persons using domestic water filter were also at lower risk (OR 0.6; CI 0.45-0.85).

We discussed with the local health authority regarding this sudden increase in diarrhea cases from these areas and informed them the hypothesis we generated. Then we discussed the situation with the local health authority and local panchayat according to the spot map and ultimately the contaminated pond and the tube-well were disinfected by them. They also started Chlorinating the water according to our recommendation. We also suggested

the health officer to educate the health workers and people regarding hygienic water handling and sanitary practices.

Executing prevention and Control Measures:

Acute gastroenteritis requires early treatment mainly rehydration with ORS and few medicines which were provided by multi-purpose health worker of the locality from their Sub Center stock. The patients who were hospitalized were treated accordingly with intra-venous drip along with injections and oral medicines. Outdoor patients were treated by few medicines. Disinfection of pond, ghat, and tube-well were done. Close vigil, follow up and survey of the locality to find out any new cases. Personal hygiene and some other health education were communicated to the local public through leaflet distribution and meeting with the active support of local panchayat. We told local public not to use the contaminated pond water temporarily for their domestic purposes.

Discussion:

The epidemiological investigation revealed the outbreak as AGE outbreak caused by faecal contamination of pond water. We found that number of cases of watery diarrhea increased on 6/5/07 with a peak and again peaked on 10/5/07. Attack rate of the people using pond water are much more than people using tube well and piped water. No other exposure (e.g. common event, food) seems to explain this geographical distribution of cases. The incidence of the disease decreased from 10th may onwards. The outbreak suggested a common source cluster. Descriptive epidemiological

characteristics pointed to an area where there was clustering of cases around the contaminated pond. There are open drains in various places and children defecated indiscriminately in these drains. These drains are going directly to the pond and contaminating the pond. Few areas were submerged in the water for few days due to heavy rain which was a common feature in monsoon. During this period, the sewage water might have contaminated the pond water. Water specimen test results showing high coli form count in pond water and tube-well water indicated the lack in the quality of the water supplied through tube-well and pond. The clustering of the cases was seen around the pond. The case control study highlighted the source of infection was possibly due to cleaning of utensils in the contaminated pond water and drinking of contaminated tube-well water. The fall in the number of cases following the disinfection of pond water and tube-well by the local authority Disinfection of pond and tube-well water and chlorination of the water sources supported this hypothesis. Practices like using of pond water for cooking purposes, for cleaning utensils, consumption of unpurified drinking water, washing clothes in pond water were significantly associated with the disease. Persons who washed hand before every feed had a lower risk of developing acute watery diarrhoea.

Based on these findings we recommended,

1. Regular chlorination and disinfection of pond and tube-well water supplying the areas.
2. Increase awareness among the people and health workers regarding the water, food handling practices.

3. Educate people regarding the deleterious effect of unhygienic sanitary practices on their health.

Our study had one limitation. We could not collect rectal swab from the cases because of non-availability of Carry-Blair media. So we could not confirm the diagnosis by laboratory examination.

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Figure 1: EPIDEMIC CURVE GE OUTBREAK KANAIPUR BLOCK HOUGHLY DISTRICT WEST BENGAL. DISTRIBUTION OF CASES BY DATE OF ONSET, AT BASAI & DAKKHINPARA, KANAIPUR HOUGHLY DISTRICT WEST BENGAL FROM 3/5/07-17/5/07

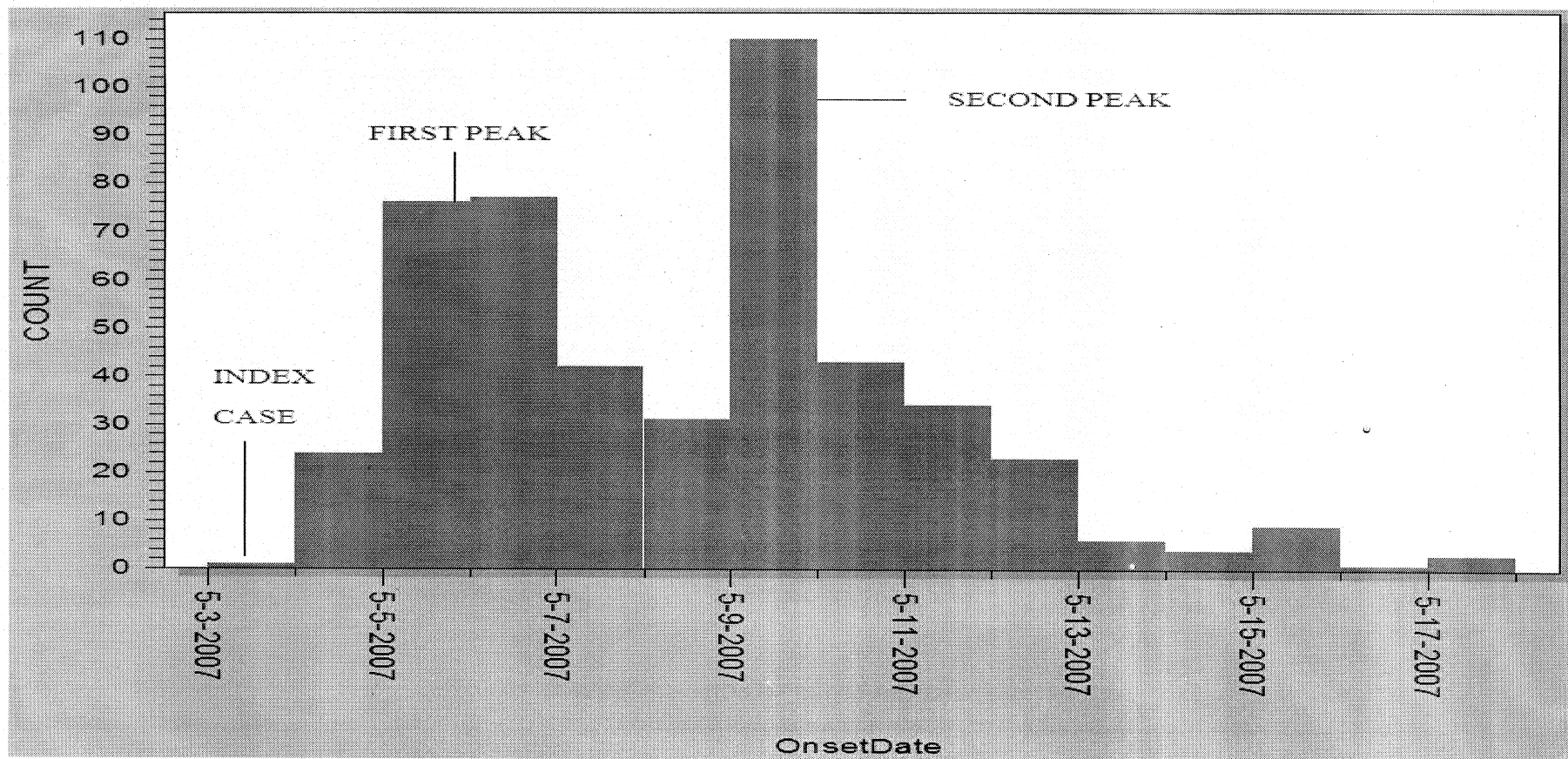


Figure: 2

The geographical distribution of cases from 3/5/07-17/5/07 in area of Basai and Dakkhinpara, Kanaipur block

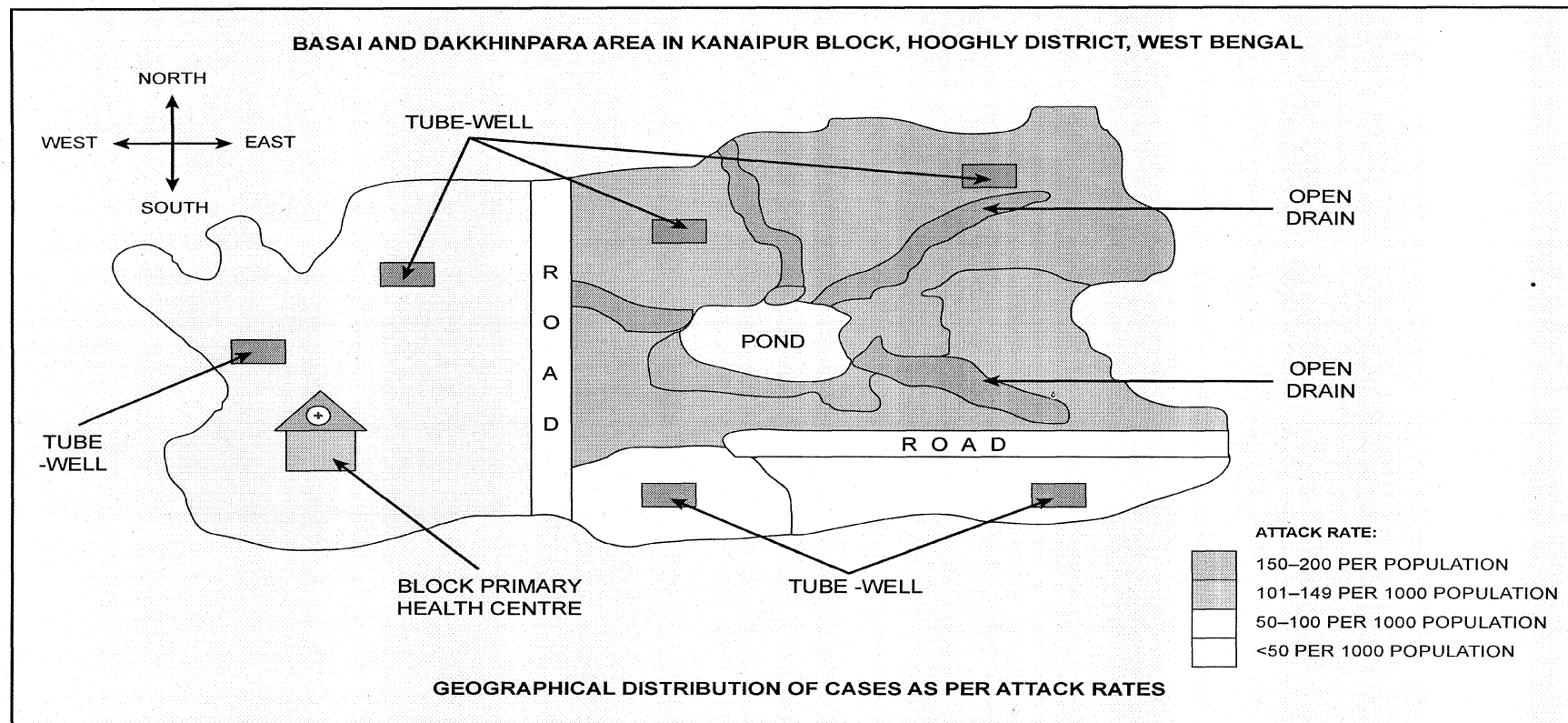


Table 1: Attack rates of gastro-enteritis by age and sex, Kanaipur, Hooghly, West Bengal, India, 2007

		Number of cases	Population	Attack rate per 1000 population
Age group (In years)	1-4	46	346	133
	5-9	57	321	178
	10-14	54	271	199
	15-44	227	1347	169
	45-60	72	451	160
	60+	28	1588	18
Sex	Male	234	2,356	99
	Female	250	1,968	127
Total		484	4,324	111

Table 2: Selected exposures among cases of gastrointestinal illness outbreak and controls, Kanaipur, Hooghly, West Bengal, India, May 2007

Exposure Variable	Frequency of cases (n=484)			Frequency of controls (n=484)			OR	Confidence Interval
	#	Total	%	#	Total	%		
Pond water used for cleaning utensils	371	484	77	124	484	25	9.5	7.04-12.93
Pond water used for drinking	26	484	5	16	484	3	1.7	0.84-3.29
Pond water used for cooking	35	484	7	21	484	4	1.7	0.95-3.11
Pond water used for Washing clothes	256	484	52	220	484	45	1.3	1.04-1.75
Pond water used for bathing	449	484	93	456	484	94	0.8	0.46-1.36
Pond water used for Washing hand and mouth	42	484	9	33	484	7	1.3	0.79-2.14
Wash hand before every feed	92	484	19	203	484	42	0.3	0.24-0.44
Use domestic water filter	87	484	18	127	484	26	0.6	0.45-0.85

3.2 Investigation of Measles outbreak at Nawabpally, Bansberia Municipality, Hooghly district, West Bengal, India, 2008.

Introduction:

Since the introduction of the measles vaccine in the Universal immunization Programme in the 1985, the morbidity and mortality due to measles in India have been substantially reduced. However, measles remains the leading cause of childhood deaths and disability due to a vaccine preventable disease (VPD). During 2007, it was estimated that 2-3 million measles cases occurred from India while the measles vaccine coverage was 87%. While still dealing with measles control issues, the country is setting up surveillance for outbreak prevention. In 2005, a national strategic plan was formulated to reduce measles mortality by two third by the year 2010 as compared to the 2000 estimates.⁸ One of the elements of the plan emphasized achieving at least 90% vaccination coverage in 80% of the districts by 2009.

Accumulation of children who are either not immunized or do not develop immunity from one dose of vaccine given at nine months of age in successive birth cohorts can result in measles outbreaks. Investigation of these outbreaks often provides information that allows preventing future ones. This includes

identification of high-risk groups, description of changes in measles epidemiology and detection of weaknesses in routine immunization.

Nawabpally area is a small-congested colony of Bansberia municipality in Hooghly district. On 1st May 2008, thirty cases of fever with rash were reported from Nawabpally area. We investigated this cluster to (a) find the etiological agent (b) estimate the magnitude of the outbreak, (c) formulate recommendations for actions.

Methods:

Descriptive epidemiology: We reviewed all municipal health department records for the previous years to calculate the incidence of measles in the area. We defined a case of measles as occurrence of fever and maculopopular rash (i.e. non-vesicular or without fluid), with cough or coryza (running nose) or conjunctivitis (red eyes) among children aged 10 years or less residing in Nawabpally, Bansberia municipality, Hooghly from 20/04/2008. We searched for cases by house-to-house visit in those affected wards. We clinically examined all the case-patients. We collected the information from the case patients regarding demographic details, vaccination status and date of occurrence of rash. We constructed an epidemic curve to describe the time distribution. We calculated the attack rates by age and sex. We studied the place distribution of case-patients by plotting a spot-map.

Laboratory investigation:

To confirm our diagnosis, we collected serum from five case patients and sent to the Measles Laboratory, Institute of Serology, Government of India, under cold chain for serological confirmation.

Analytical study

We conducted a retrospective cohort study in Nawabpally among children aged 10 months to 10 years residing in Nawabpally area. Our null hypothesis was that the measles vaccine was not associated with any protection against the disease. Our exposure variables were the vaccination status. Our outcome variable was the disease status. To ascertain the immunization status we either reviewed the records in eligible couple and child register (ECCR) or used mother's interviews. Children who have had measles in the past, as reported by mother were excluded from the study. We also enquired mothers about the reasons for non-vaccinating their children.

We calculated the vaccination coverage in the area. We calculated attack rates of measles by vaccination status. We also calculated the vaccine efficacy after excluding the children under 9 months of age, as these children are not eligible to receive measles vaccine according to UIP. We calculated Relative Risk (RR) and their 95% confidence interval (CI). We also calculated vaccine efficacy using formula of $(1-RR)$.⁵

Results:

Descriptive epidemiology:

We identified 39 case patients from 505 children residing in Nawabpally area with an overall attack rate of 8% (Table-1). All the case patients received treatment in their home and none was admitted in hospital. Five case patients had pneumonia. One case patient died (case fatality ratio= 3%). Only one case patient was administered vitamin-A oil. All the sera were positive for IgM antibody against measles. The median age of the case patients was 4 years (range: 48-60 months). Only one case patient had received measles vaccine. The attack rates were highest among children aged 13-24 months (16%) and females (9%) Table-1. The epidemic started from 20th April 2008, peaked during the week of 4th May 2008 and then subsided in the week of 18th May 2008. The spot map indicated that measles cases were distributed all over the colony.

Analytical epidemiology:

We included 505 children aged 10 months to 10 years in the cohort study. Of these, 206 (41%) had received measles vaccine. The main reasons cited for not vaccinating the children were unawareness 49% (146/299). Attack rates of measles among vaccinated and un-vaccinated children were 5/1000 (1/206) and 127/1000 (38/299) respectively. The Relative Risk (RR) associated with measles vaccination was 0.04 (95% CI 0.01-0.28). The measles vaccine efficacy was 96.2% (95% CI= 72.4-99.5)

Discussion:

An outbreak of measles occurred in a religious minority community in Bansberia municipality, Hooghly from 20th April to 19th May, 2008. The results of the analytical study indicated that the outbreak occurred due to low vaccination coverage in the area.

Despite the widespread availability of a safe and effective vaccine, failure to administer at least one dose of measles vaccine to all infants is the main cause of measles mortality and morbidity. The results of the investigation indicated that the outbreak occurred in the area due to low coverage of measles vaccine. The coverage of measles vaccination in Hooghly district during 2007 was 88%. The coverage in Nawabpally locality however was very low. This low vaccination coverage in the area was probably due to low demand of the vaccine in community. This community is known for poor willingness to participate in vaccination efforts. Majority of the mothers told that they were unaware about the need for vaccination. It is therefore necessary to educate the community about the importance of administering all the childhood vaccines.

One of the limitations of our investigation was that none of the children in the area had immunization card. Immunization status of children was therefore based on mother's history. This might be the reason for higher vaccine efficacy observed during the study.

As most of the immunization cards were missing, we depend on the verbal discussion with the parents of the children.

In conclusions, the results of the investigation indicated that the outbreak occurred in a religious community, known for poor participation in routine immunization activities, with low vaccine coverage over years. On the basis of these results we recommended to (1) strengthen the routine immunization service delivery in the area (2) find out the reasons for the low acceptance of immunization (3) examine ways to increase the demand for vaccine among religious minorities with the help of community members (4) improve measles surveillance in the district.

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4. An outbreak of measles in Neturia Block, Purulia district, West Bengal 2007
5. Case study: An outbreak of measles in Purulia, India, Dr. Asit Biswas
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Fig 1, Epidemic curve, by time distribution of measles cases, Bansberia, Hooghly, West Bengal, India, 2008, (n=39)

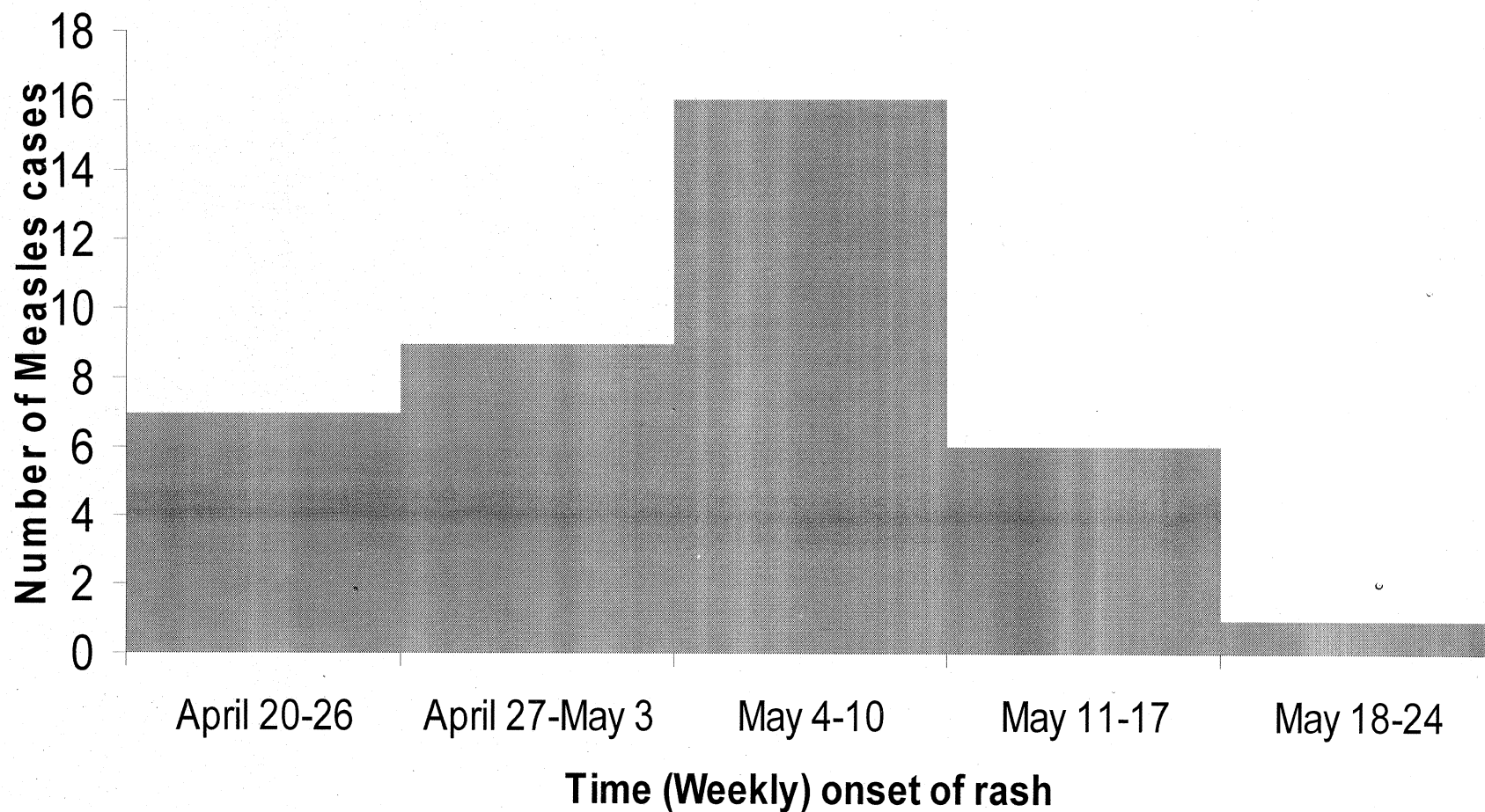


Fig 2, Spot Map, by place distribution of measles cases, Nawabpally, Hooghly, West Bengal, India, 2008, (n=39)

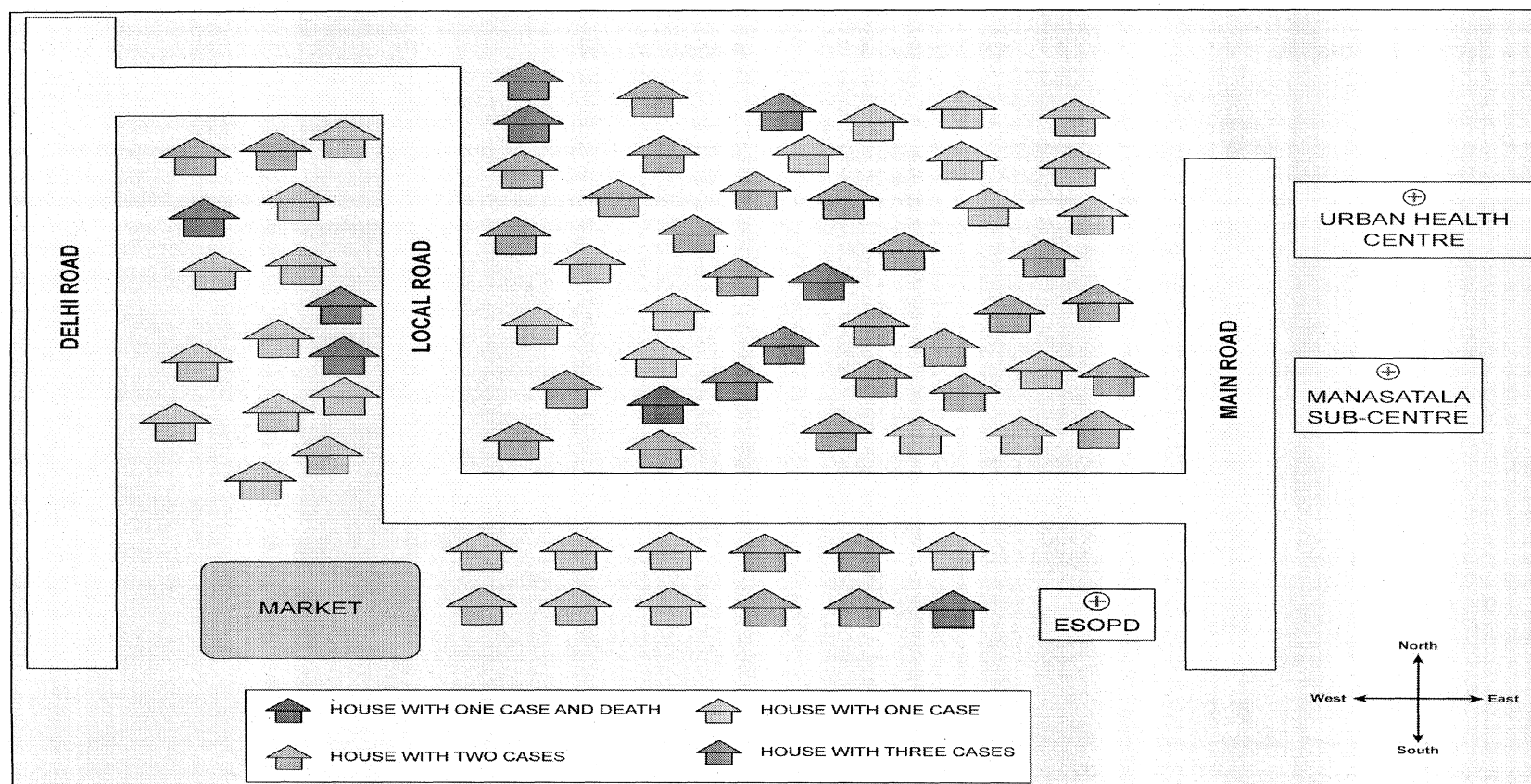


Table- 1: Incidence of measles by age & sex, Nawabpally, Hooghly, West Bengal, India, 2008

	No of cases	Population	Attack rate (%)
0-9 months	3	87	3
10-12 months	1	20	5
13-24 months	7	43	16
25-60 months	22	163	13
Age 61 months-120 months	6	192	3
Sex Male	21	297	7
Female	18	208	9
Total	39	505	8

3.3 Outbreak of Chikungunya fever at Monber village, Mrigala

- **Gram panchayat, Chanditala block Hooghly district, West Bengal, India, September, 2008.**

Introduction:

Chikungunya is a debilitating viral illness caused by the Chikungunya virus and is spread by the bite of infected *Aedes* mosquitoes, primarily *Aedes Aegypti*. The disease often presents itself with sudden onset of fever that may be accompanied by rigors. Joint pains then appear that are often incapacitate the patients because of their severity. Bleeding and rash are also possible.¹

Outbreaks of Chikungunya are usually explosive, with infection of a large proportion of the susceptible population within a few weeks. Prolonged evolutions are possible, with multiple peaks of incidence. The fever affects predominantly older age groups and women. In India, the first outbreak of Chikungunya was reported in 1963 in Kolkata. Till 1973, several large-scale outbreaks were reported from different parts of the country. Interestingly, during late 70s and early 80s, no Chikungunya activity was reported from India and hence it was hypothesized that the virus has disappeared in India. However, the virus has recently re-emerged in the country possibly through migrations in the Indian Ocean. Since December 2005, large numbers of cases of Chikungunya have been reported from several Indian states including Andhra Pradesh, Maharashtra, Karnataka, Tamilnadu and Madhya Pradesh.⁴ In February 2006, virological investigations confirmed the diagnosis of Chikungunya on the basis of serological diagnosis in a subset of patients. As of March 2006, more than 9,000 cases had been reported since December 2005 in the state of Andhra Pradesh with attack rates ranging from 2.3 to 39%

in villages. No deaths were reported. After the last Chikungunya outbreak in 1963, no outbreak was reported in West Bengal. Chikungunya re-emerged in West Bengal in 2006 and 2007 with large outbreak in North-24 Paraganas and Hooghly district. There were 723 cases and 9 villages affected in Hooghly district in 2007.

Neyepara of Monber village is a small, congested area of Mrigala gram panchayat of Chanditala block in Hooghly district. On 22nd September 2008, gram panchayat pradhan of Mrigala gram panchayat reported to the Block Medical Officer of Health (BMOH), Chanditala about the occurrence of several cases of fever with joint pain and rashes in Neyepara anchal of Mrigala GP on 23rd September, 2008, BMOH reported to the Deputy Chief Medical Officer of Health that 50 cases of unknown fever along with joint pain and rashes occurred in Neyepara anchal of Monber village. The district epidemic cell investigated the outbreak on 24th September, 2008 to (a) find the etiological agent (b) estimate the magnitude of the outbreak, (c) formulate recommendations for actions.

Methods:

Descriptive epidemiology:

We defined a case of Chikungunya as combination of fever, joint pain and rash in a resident of Monber village of Chanditala block, Hooghly from 26/08/2008 to 27/09/2008. We conducted house to house search from 25th to 27th September '08 along with the block, local and district health team and panchayat functionaries. Case-patients recorded in OPD register were also

included. For each identified case, we collected information regarding age, sex, residence, date of onset of joint pain, signs and symptoms and outcome. We also interviewed and examined the index case. We constructed Epi-curve to know the distribution of cases by time. We calculated attack rate of suspected Chikungunya by age and sex. We plotted a spot map to know the distribution of cases by place.

Laboratory investigation:

To confirm the diagnosis, we collected serum from 10 suspected case patients and sent to the school of Tropical Medicines Kolkata, under cold chain for serological confirmation. Sera samples were tested for IgM antibodies against Chikungunya.

Entomological and Environmental investigation:

We inspected the housing of the affected village searched for exposures relevant to occurrence of cases. We checked all discarded garbage around the households. We checked the surroundings of the pond to see whether there were any discarded materials along with larvae of mosquitoes. We also searched for other exposures relevant to the outbreak. We conducted an entomological survey with the help of an entomological team from the district level and calculated the following vector indices:

Container index: Number of containers positive for *Aedes Aegypti* larvae/dip.

Bretau index: Number of container positive for mosquito larvae per 100 households.

Results:

Descriptive epidemiology:

We identified 52 case patients meeting the case definition from the village with overall attack rate of 11% (Table-1). The patients presented with severe joint pain involving both small and large joints of the body with moderate to high fever. In most cases, more than one joint was involved. 80% of cases presented with vomiting with fever (42/52), and 30 % (16/52) had macular rash on the body which persisted with 4-7 days. 44% (23/52) of patients had swelling of one or more joints along with joint pain. The fever subsided within 4-5 days, but in 27% cases (14/52) the joint pain persisted for more than 7 days even after fever subsided. There was no death reported. The epidemic started from 26th August, 2008, with a peak on 21st September, and then declined by 25th September onwards (Figure-1). The median age of the case patients was (26-33 years). The attack rate was highest among 15-44 years age group (63%) and females were more affected (Attack rate: 13%) [Table-1]. The spot map indicated cases were distributed all over the area (Figure-2).

Laboratory investigation:

3 out of 10 (30%) serum samples tested were positive IgM antibodies against Chikungunya. None of the blood smears were positive for malaria.

Environmental and Entomological assessment:

We surveyed 92 houses in the village. All houses had poor sanitary conditions. People were storing water in variety of containers. Majority of the household in the area had small water bodies beside the houses. We

identified 68 water-containing containers from these houses, of which 11 contained *Aedes aegypti* larvae with a container index of 16%. The Breteau index was 12%.

Preventive and control measures

Panchayat functionaries and the health workers were advised to dispose and dump all the coconut shells and discarded materials which were lying around the household as early as possible. We sprayed kerosene oil at dumping places of coconut shell and around the household. We distributed leaflets and conducted panchayat level meeting along with all health staff of that area. Medical Officer, Health Supervisor and The Multipurpose Health Workers were advised to distribute paracetamol tablets and other symptomatic treatment among the case patients. We also advised to continue active surveillance till the outbreak is over.

Discussion:

The epidemiological, entomological and laboratory investigations revealed that the outbreak occurred in the village was due to infection of Chikungunya virus. Out of ten samples three were positive for Chikungunya IgM antibody. Attack rates were high in 15-44 years of age group and among the females. Presence of the mosquito vector, *Aedes Aegypti* and high larval breeding facilitated transmission of infection.

Outbreaks of Chikungunya have been reported from Sub-Saharan Africa, India, Southeast Asia and the Philippines. They are usually explosive, with

infection of a large proportion of the susceptible population within a few weeks. Prolonged evolutions are possible; with multiple peaks of incidence.¹ The fever affects predominantly older age groups and women. In India, the first outbreak of Chikungunya was reported in 1963 in Kolkata. On the other hand, Chikungunya outbreaks reported in sixties and seventies from India were due to Asian genotype of the virus.² We also observed higher attack rate among adult and females. Higher attack rate also observed in outbreaks of Indonesia, Malaysia and Philippines.^{3,4,5} Majority of the women in this area are homemakers and exposure to Aedes mosquito during daytime household activities might have put them at higher risk of infection. Unlike Dengue fever, children were less affected. Lower attack rate among children were also reported in Chikungunya outbreak of that occurred in India during the sixties, and also the recent outbreak in Indian Ocean islands.⁶ Vector control in the outbreak is one of the very important measures for controlling the outbreak. It is also necessary to involve communities in vector control by educating them about cleaning the surroundings, covering the peridomestic containers and emptying them at least once in a week.^{7, 8, 9}

Before the present outbreak in Chanditala block, outbreaks of Chikungunya were occurring in the neighboring districts. Presence of lot of water collections in the area especially as the outbreak occurred just after the rainy season contributed the heavy breeding of the vector. Stagnation of water bodies was the favorable environmental conditions for multiplication of Aedes Aegypti. All of these cause the outbreak of Chikungunya.

On the basis of the results of the investigation, we formulated the following recommendations: Vector control in the outbreak and adjoining areas remains one of the important measures for controlling Chikungunya outbreak. It is also necessary to involve communities in vector control by educating them about cleaning the surroundings, covering the peri-domestic containers and emptying them at least once a week.

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9. Chikungunya virus racing throughout India now.

Fig- 1, Epidemic curve, by time distribution of Chikungunya cases, Chanditala, Hooghly, West Bengal, India, 2008, (n=52)

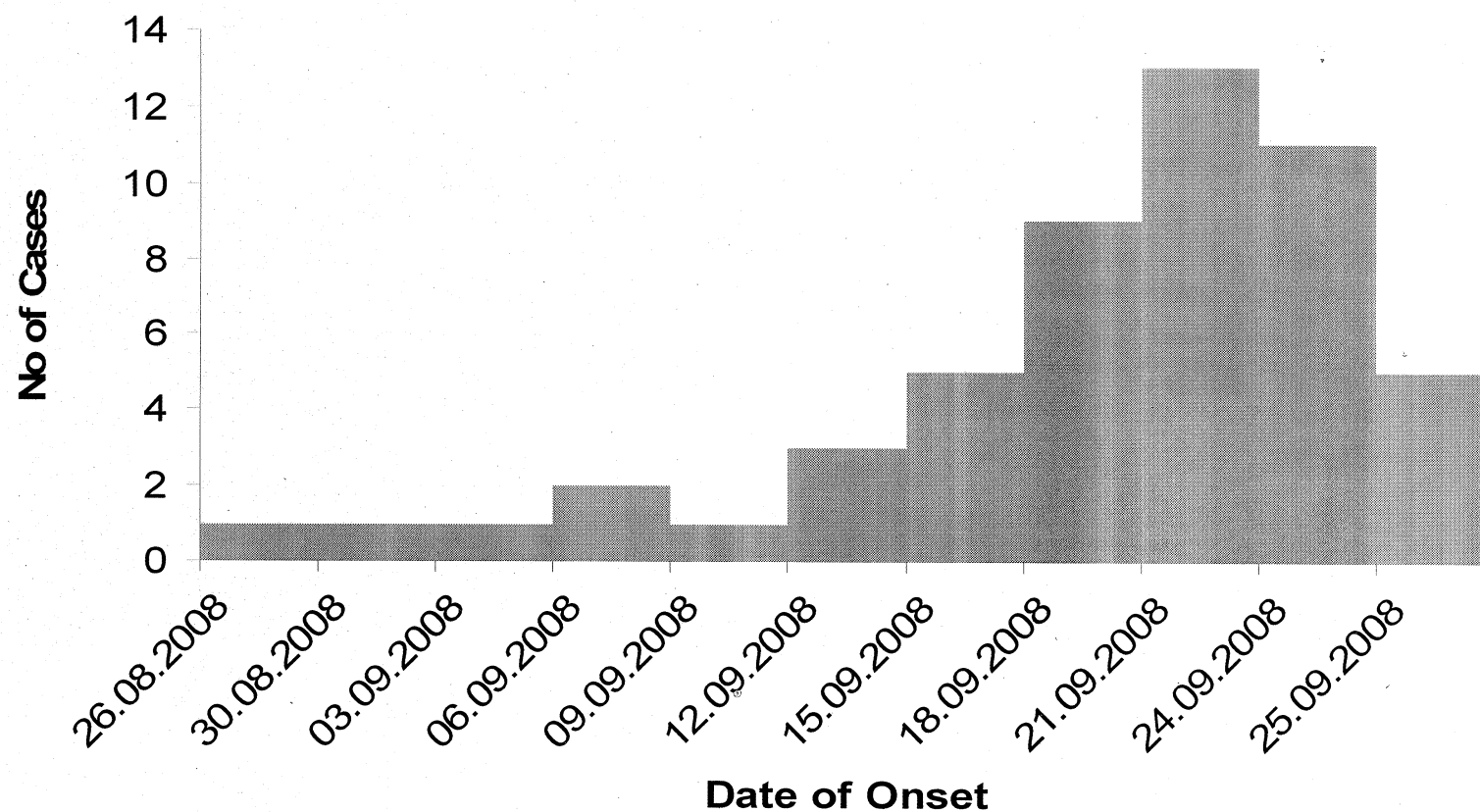


Fig 2, Spot Map, by place distribution of Chikungunya cases, Chanditala, Hooghly, West Bengal, India, 2008,(n=52)

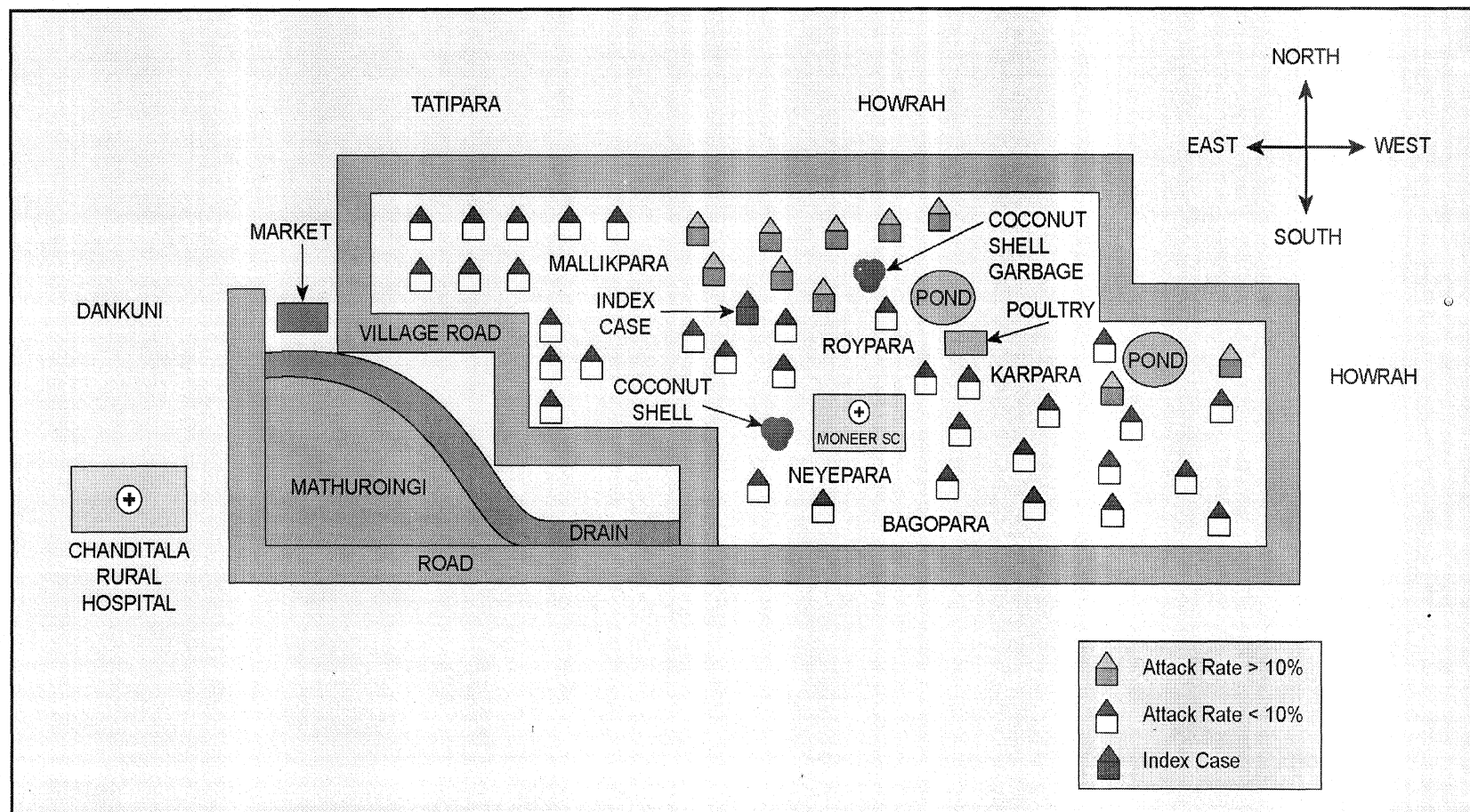


Table- 1: Incidence of Chikungunya by age & sex, Chanditala, Hooghly, West Bengal, India, 2008

		No of cases	Population	Attack rate (%)
Age	1-4 Years	2	34	6
	5-9 Years	0	34	0
	10-14 Years	5	60	8
	15-44 Years	33	248	13
	45-60 Years	7	69	10
	60+ Years	5	41	12
Sex	Male	19	231	8
	Female	33	255	13
Total		52	486	11

3.4 Outbreak investigation of acute diarrhoeal diseases in Serampur and Rishra Municipality, Hooghly, West Bengal, India, October, 2008.

Introduction:

The potential agents of gastro-intestinal illnesses include bacteria (e.g., staphylococcus aureus, bacillus, cholera, salmonella and shigella), viruses (e.g., noravirus and rotavirus) and parasites (e.g., giardia and cryptosporidia). Of these only a few pathogens cause epidemic diarrhea. In developing countries, two etiologic agents are responsible for most epidemic diarrhea: toxigenic *Vibrio cholerae*, which causes watery diarrhea, and *Shigella* species, which causes bloody diarrhea or dysentery. Typical cases like cholera are characterized by the sudden onset of profuse, effortless, watery diarrhea followed by vomiting, rapid dehydration, muscular cramps and suppression of urine. Unless there is rapid replacement of fluid and electrolytes, the case fatality may be as high as 30 to 40 percent. Diarrhoeal diseases are still the major killer diseases. Epidemics of diarrhoeal diseases are characteristically abrupt and self-limiting. Transmission occurs from one human being to another one via (a) faecally contaminated water (b) contaminated food and drink (c) person to person transmission. Epidemiological studies indicated that for about 5-10% of all acute diarrhoea cases exist in non-epidemic situation.¹

Hooghly district is one of the largest district of West Bengal, India with a population of 5.9 million (Census 2001) and population density 1601/sq. km. Between January 2005 and March 2007, 18 outbreaks of diarrhoeal disease were reported in the district. Of these, one outbreak was confirmed due to cholera and 11 occurred in urban areas. Factors that may increase the risk of diarrhoeal diseases in the district include frequent floods, water logging, and contamination of water supply due to poor maintenance of pipeline in urban areas. On 7th October, 2008, the health officers of Serampur and Rishra Municipality informed the district health officials about an increased incidence of diarrhea cases in two wards of Serampur (ward no. 24, 25) and three wards of Rishra Municipality (ward no. 2, 18 & 19). Many patients from these wards were admitted in the hospital due to moderate to severe dehydration. As per instruction of the Chief Medical Officer of the district, we investigated the cluster of diarrhoeal cases with the following objectives (1) identify the causative agent, (2) identify source of infection, and (3) control the outbreak and propose recommendations to prevent future outbreaks.

Methods:

Descriptive epidemiology:

We reviewed all municipal health department records for the previous years to estimate the incidence of diarrhoeal diseases in the area. We looked for any change in case definition, surveillance system or population influx to this area. We defined a case as acute watery diarrhea (more than one loose stool during a

24-hour period)' in a resident of ward no 24, 25 of Serampur and ward no 2, 18 & 19 of Rishra municipality from 06-10-2008 to 15-10-2008. We searched for cases by house to house visit in those affected wards. We collected information about demographic details, area of residence, signs and symptoms and date of onset from the case patients identified. We described the distribution of cases by time by constructing epi-curve, place distribution by preparing a spot map, and person distribution by calculating age and sex specific attack rate. To generate hypothesis we interviewed few case patients to collect information regarding travel history, mass gathering in that area, water consumption, presence of food vendor in that locality, water storage and food handling practice, washing hand before food and after defecation from the index case and some other case-patients.

Analytical study

Clustering of cases near the leakages in water pipelines led us to generate the hypothesis that this outbreak occurred due to consumption of contaminated drinking water supplied by municipality. To test the hypothesis, we conducted an unmatched case control study among the population of ward no 24, 25 of Serampur and ward no 2, 18 & 19 of Rishra municipality, Hooghly. We calculated a sample size of 62 cases using the Epi-Info software, for a power of 80%, a prevalence of exposure of 56%, for an odds ratio of 3 and a confidence coefficient at 95%. We defined a case as a resident of ward no. 24, 25 of Serampur and ward no 2, 18 & 19 of Rishra municipality with acute watery diarrhea from 6th

October, 2008 to 15th October, 2008. We defined a control as a resident of any age without acute watery diarrhea, and/or vomiting of ward no. 24, 25 of Serampur and ward no 2, 18 & 19 of Rishra municipality from 6th October, 2008 to 15th October, 2008. We prepared a pre-tested structured questionnaire to interview both cases and controls and translated in local Bengali language. We trained the municipal health workers about the method of collecting the data. We calculated unmatched odds ratios and their confidence intervals (CI).

Laboratory investigation:

We sent 5 stool samples for identification of the causative organism to School of Tropical Medicine, Kolkata for isolation of causative organism.

Environmental investigation:

We checked the pipelines of the water supply system, pipe water supply points at the households, and location of sewage drains. We collected four water samples from tap and tube-well water and sent those water samples to school of Tropical Medicine for testing of faecal coli forms.

Results:

Descriptive epidemiology:

The incidence of diarrhoea recorded in the month of October ranged within .05% to 1% from 2004 to 2006. We found definite increase in incidence and clustering of cases in ward no. 24, 25 of Serampur and ward no 2, 18 & 19 of Rishra

municipality from 6th October, 2008 to 15th October, 2008. We identified 105 case patients from a population of 8243 with an overall attack rate of 1.2%. Maximum attack rate was observed among 15-44 yrs. age group (2.05%). The least affected age group was 5-14yrs age group and 60+ yrs age group (0.9%). Attack rate was higher (1.6%) in males than females (0.8%). (Table1). Besides watery diarrhoea, 87 case patients (82%) had vomiting and 16 (15%) had dehydration. 8% of the affected people were admitted in Walsh sub-Divisional hospital (n=8). The cases started occurring from 6th October, 2008, peaked on 13th October, and sharply came down on 15th October. The distribution of cases suggested a common source epidemic (Figure-1). The geographical distribution showed distribution of cases around the area where the leakage point was identified, i.e. Pravashnagar, R.K. Road area of ward no 24 & 25 of Serampur municipality. The index case belonged to Pravashnagar. Few leakage points in the pipeline were detected near to the residence of index case. There were no common events among the residents in the area.

Environmental assessment:

Source of drinking water supply in the affected wards was from nearby water reservoir supplied intermittently through pipelines and Tube-well. The pipelines supplying the households crossed the open drains in various areas in which children defecated indiscriminately. These open drains, which were interconnected within themselves with other areas, were overflowing due to recent rains thereby. Public health engineering department (PHE) detected four

leakage points in the pipelines supplying ward no 24, 25 of serampore and ward no. 2, 18 and 19 of Rishra.

Laboratory investigation: School of Tropical Medicine examined the stool and water samples. No pathogen was identified in stool samples. All the three water samples from tap water were faecally contaminated. One water sample taken from the deep tube-well of ward no: 25 had no evidence of fecal contamination.

Analytical epidemiology:

Individuals who drank tap water were at a significantly higher risk of developing diarrhoeal diseases (OR 5.97; 95% CI 2.51 – 14.4). None of the other exposures were associated with illness (Table 2).

We discussed with the local health authority regarding this sudden increase of diarrhea cases from these areas and informed them the hypothesis we generated. Then the leakage was detected according to the spot map and repaired by the municipal public health engineering department on 14th October. They also started Chlorinating the water according to our recommendation. We also suggested the health officer to educate the health workers and people regarding hygienic water handling and sanitary practices.

Discussion:

The epidemiological investigation and laboratory investigations revealed that the outbreak occurred due to faecally contaminated water, probably contaminated through leakage in pipelines. The clustering of the cases was also seen around

the leakage. The fall in the number of cases following repair of the leak in the pipeline and chlorination of the water sources supported this hypothesis. The case control study highlighted the source of infection was possibly due to consumption of contaminated drinking water supplied by the municipality.

The pipelines crossed open drains in various places and children defecated indiscriminately in these drains. Few areas of ward no. 24 and 25 were submerged in the water for few days due to rain which was a common feature. During this period, the sewage water might have contaminated the supply water through the leakage by negative suction. The leakage in the pipeline detected near the house of the index case which was also submerged under water. Practices like consumption of unpurified drinking water, were significantly associated with the disease. A review of the studies revealed that municipal areas supplied with inadequately chlorinated piped water are at risk for epidemic of diarrhoeal diseases.^{3,4,5,6} In Hooghly district; outbreaks caused by contaminated water supplied through poorly maintained pipeline are not uncommon. Between 1 January 2005 and 31 March 2007, the district surveillance system implicated contaminated water supplied through poorly maintained pipeline as the cause of 11 outbreaks (Out of 18) of diarrhoeal diseases in 12 municipalities. Out of those, 1 outbreak was due to *Vibrio Cholerae* El Tor 01 Ogawa. Population under the municipalities has increased many folds, but little has been done to upgrade and maintain the age-old water supply system. Ill maintained pipe water supply system was the recurrent source of infection of diarrhoeal outbreaks in the urban municipalities. Many other

studies like Hepatitis-E outbreak in Hyderabad, AP, AGE outbreak Barasat, WB and other investigations reported cholera and diarrhoea outbreaks in municipal areas supplied with piped water systems that suffer from damage in supply system and maintenances.^{7, 8, 9}

Our study had one limitation that no organism could be detected from the stool samples. Most probably stool was collected after starting of antibiotics, though it was not documented.

We recommended,

1. Regular maintenance of pipelines for any leakage, at least where they crossed the sewage drains in a regular intervals by PHE department.
2. Regular chlorination of water supplying the wards.

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Figure 1: Distribution of diarrhea cases by date of onset in Serampur and Rishra of municipality, Hooghly, west Bengal, India, 2008 (n=105).

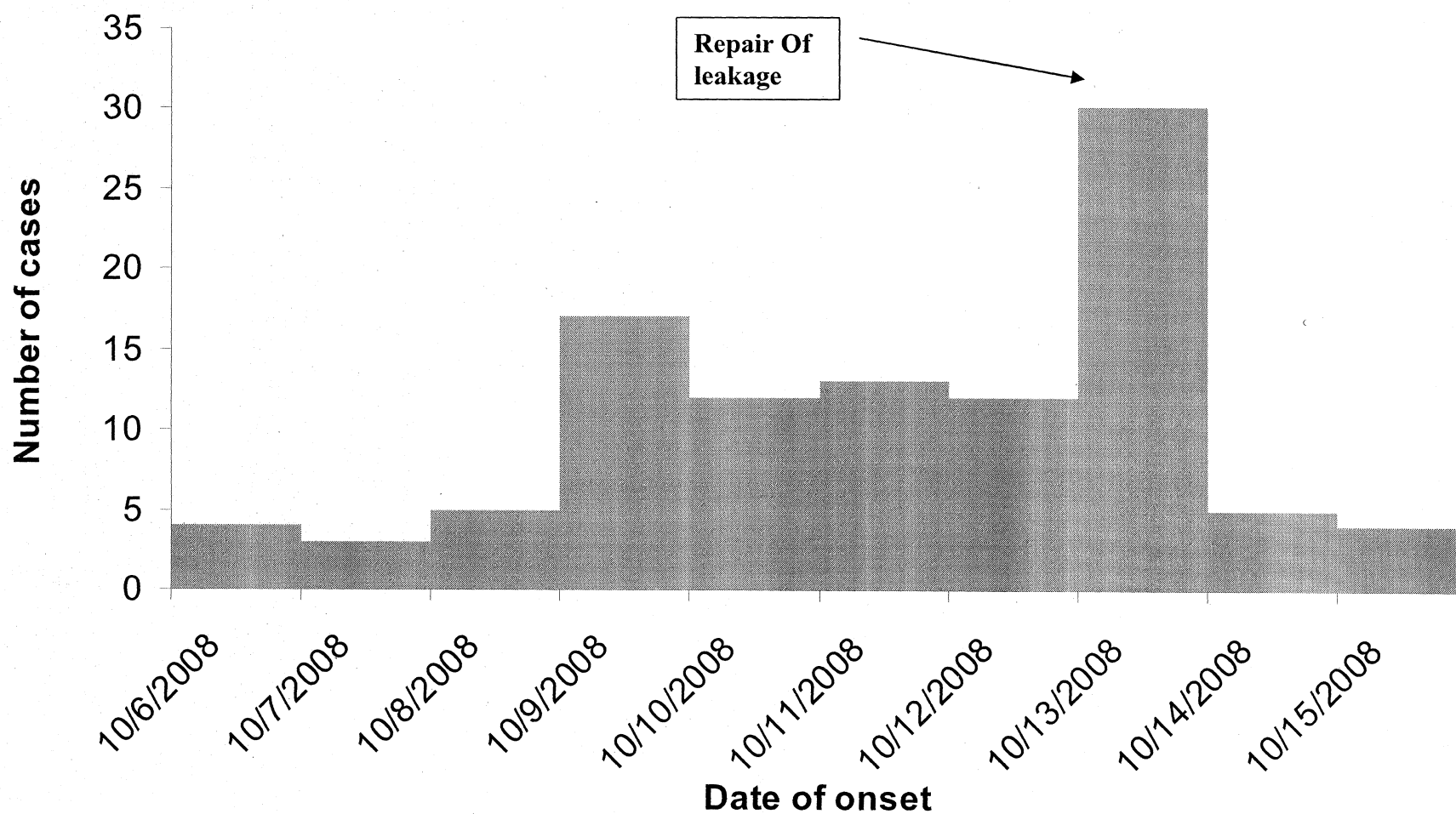


Figure 2: Distribution of diarrhea cases by spot map in Serampur and Rishra municipality, Hooghly district, West Bengal, India, October 2008 (n=105).

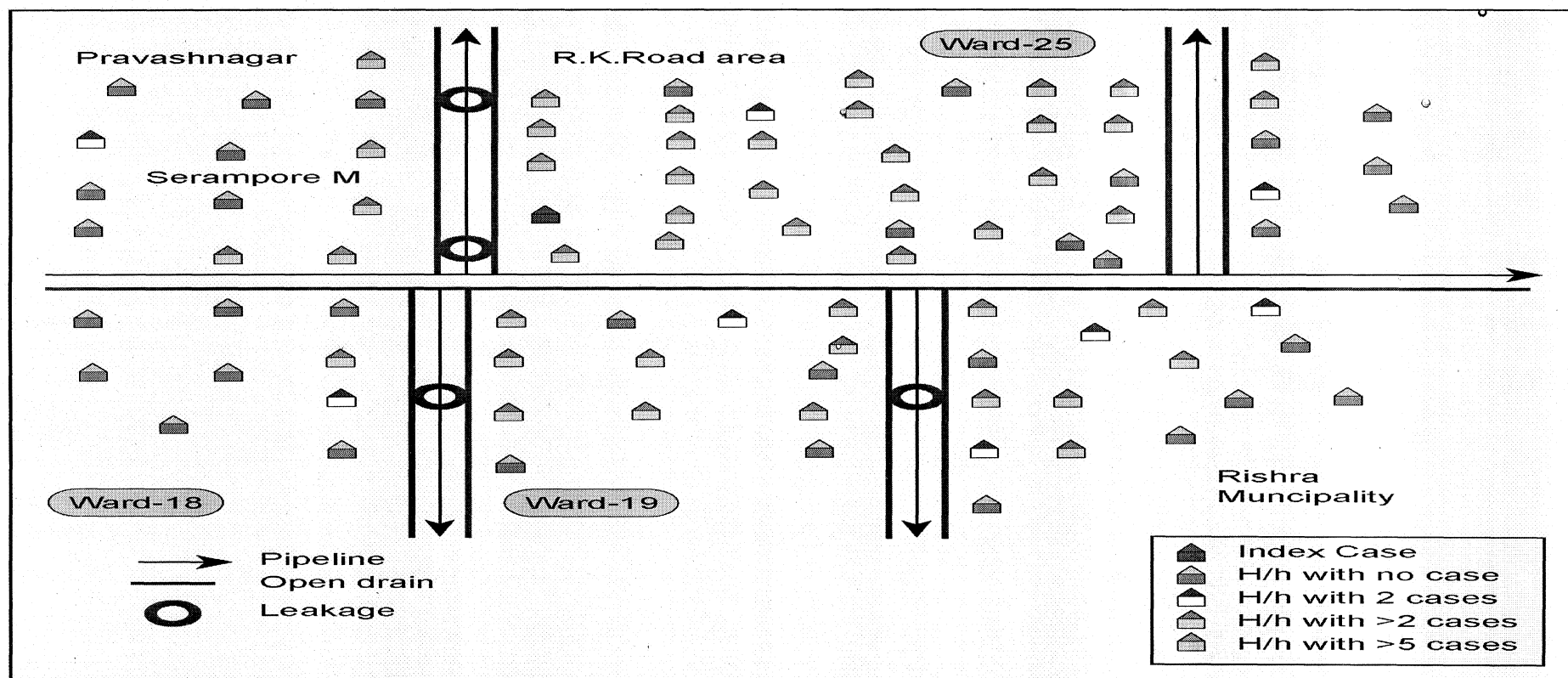


Table 1: Attack rate of diarrhea cases by age and sex in Serampur and Rishra of municipality, Hooghly, west Bengal, India, 2008.

Characteristics	Age group (yrs)	Number of cases	Population at risk	Attack rate
Age	<5	12	819	1.4 %
	5-14	21	2212	0.9 %
	15-44	34	1654	2.05 %
	45-59	26	2316	1.1 %
	60+	12	1242	0.9 %
Sex	Male	74	4579	1.60 %
	Female	31	3664	0.8 %
Total		105	8243	1.2 %

Table 2: Selected exposures among cases of gastrointestinal illness outbreak and controls, Serampur and Rishra municipalities, Hooghly, West Bengal, India, October, 2008

Exposure Variable	Frequency of cases # (n=62)	Total	%	Frequency of controls # (n=62)	Total	%	*UMOR	±Confidence Interval
Tap water used for cleaning utensils	31	62	50	34	62	54 ^a	0.82	0.38-1.77
Tap water used for drinking	49	62	79	24	62	39	5.97	2.51-14.40
Tap water used for cooking	42	62	68	46	62	74	0.73	0.31-1.71
Tap water used for bathing	39	62	63	31	62	50	1.7	0.78-3.70
Tap water used for Washing hand and mouth	23	62	37	29	62	47	0.67	0.31-1.46
Wash hand before every feed	12	62	19	11	62	18	1.11	0.41-3.02
Use domestic water filter	4	62	6	6	62	10	0.64	0.14-2.76

Section 4

CRITIQUING OF

SCIENTIFIC LITERATURE

Master of Applied Epidemiology (MAE) – Indian Field Epidemiology Training Programme

Scientific study critique form

General information: There is annual outbreak of acute encephalopathy among children in western part of Uttar-Pradesh due to intoxication of some phytotoxin which causes Hepato-myoencephalopathy, a syndrome which is fatal.

Title of the paper: Cassia Occidentalis as the probable cause of Hepatomyoencephalopathy in children in western Uttar-Pradesh

Authors: V.M. Vashistha, Amod Kumar, T.jacob.John, N.C. Nayak.

References: Indian J Med Res 125, June 2007, pp 756- 762.

Reviewer: Dr. Kisalay Datta

Date: 29/09/2007

General narrative comments: A case control study was conducted on outbreak of childhood Hepatomyoencephalopathy with high case fatality in western UP after consuming C. Occidentalis beans. The natural cycle of the plant explains the strong seasonal association. The absence of other causative agent and

histopathological report supports phytotoxin as possible cause but no single toxin could be identified. Line listing of the outbreak as per protocol was not mentioned and stepwise procedure of outbreak was not followed. The over all analytical study was elaborated except PAF. Active case search was not done.

Table-1: Overall assessment of the paper

Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
	1	2	3	4	5	
The background provides a description of the public issue at the global and local levels and logically introduces the need to answer a specific research question.			✓			The background does not provide a description of the public issue at the global and local levels but logically introduces the need to answer a specific research question.
The methods section provides sufficient information on the methods used, including the type of study, the sampling strategy, the case definitions, the data collection and the data analysis.					✓	The method section provides information on method used, sampling strategy and case definition. The data collection & analysis plan was appropriate.
The results reports sound scientific results that meet the study's objective and the research question. They are presented with sufficient details and adequate statistical information (e.g., Confidence Intervals).					✓	The result section explained the odds ratio, 95% confidence interval and p value. These values are important to show the association and strength of association.
The discussion summarizes and interprets the results, discusses the findings in view of what is already known, frames what the results of the study can support, defines the limitation of the work and suggests next steps in terms of (1) intervention and (2) research.				✓		Discussion summarizes and interprets the result but the precision is bit compromised

Table-2: Methods of outbreak investigation

Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
	1	2	3	4	5	
study design adequate to meet the objective.					✓	Retrospective analytical study
The study population is well defined and relevant to the research question					✓	Community based local population were best study population
Definitions are specified, sound and based upon standardized criteria when available.		✓				The definition was not supported by specific laboratory test
Sampling methods are statistically sound and adapted.					✓	Sampling was correctly done from neighbourhood and relatives sharing the same demographic variable.
The sample size was estimated beforehand appropriately.					✓	Sample size is justified at 3 times the number of cases as number of cases is small.
The study is exempt from bias.				✓		Age matched-no confounding and selection bias, semi structured questionnaire is not elaborate so biasness cannot be commented.
The data that were collected are well described and relevant.					✓	Data collection is relevant as the possible cause was consumption of C. occidentalis beans by rural unsupervised children.
The data was collected was of sufficient quality.		✓				Line listing of cases was not followed
The analysis is thought beforehand and appropriate.			✓			Age and sex distribution analysis lacking.
The indicators generated are appropriate and well calculated.			✓			Age & sex wise rate, ratios and proportion are not calculated.
The statistical tests used are appropriate and well computed.				✓		Statistical tests used are well computed except PAF.
Appropriate attention has been given to human subject protection issues.			✓			Ethical issues are not mentioned.

Table-3: Writing of outbreak investigation reports

Checklist items	Grading from 1 (strongly disagree) to 5 (strongly agree)					Explanations
	1	2	3	4	5	
The content is well distributed by chapters and sections.	✓					Stepwise outbreak investigation was not followed.
The language is simple and clear. The word count is < 3000.				✓		The language is simple and clear. The word count is more than 3000.
The writing is sequential, going from one point to the next.			✓			The introduction section contains definition and result section contains method and discussion.
The active voice is used throughout.		✓				Not explanatory up to the mark.
The vocabulary is precise, consistent and standardized.			✓			Repetition of statement noticed.
There are no more than five tables and or figures. All are needed.				✓		1) 2 tables and 1 figure 2) Figure C was not needed.
The choice of graph or table to display information is judicious.		✓				No graph and classical line listing of cases, spot map is also lacking.
The tables are clear, exact and the totals add up.		✓				No 2X2 table, so it is not clear, exact and adapted.
The graphs are effective, appropriate and understandable.		✓				No graph, no epidemic curve, whether it is point source or multiple exposure, cannot be concluded.